EVS

Standards 3 to 5

JOY OF LEARNING

Handbook of Environmental Education Activities

SKM-136

Developed by

Centre for Environment Education and
Vikram A. Sarabhai Community Science Centre

in collaboration with

VIKSAT and **Darpana Academy of Performing Arts**

For the

National Council of Educational Research & Training (NCERT)

Sudeshna Sinha

SWARAJYAM
Estd.-1989
N. 24 Pgs.
Vill. & P.O.: Andharmanik

JOY OF LEARNING

Handbook of Environmental Education Activities

Standard 3 to 5

Developed by

Centre for Environment Education

and

Vikram A. Sarabhai Community Science Centre

in collaboration with

VIKSAT and **Darpana Academy of Performing Arts**

For the

National Council of Educational Research & Training (NCERT)

Centre for Environment Education
Nehru Foundation for Development
Thaltej Tekra, Ahmedabad 380 054

JOY OF LEARNING

Handbook of Environmental Education Activities

Vol. 1 Standards 3 to 5
Vol. II Standards 6 to 8

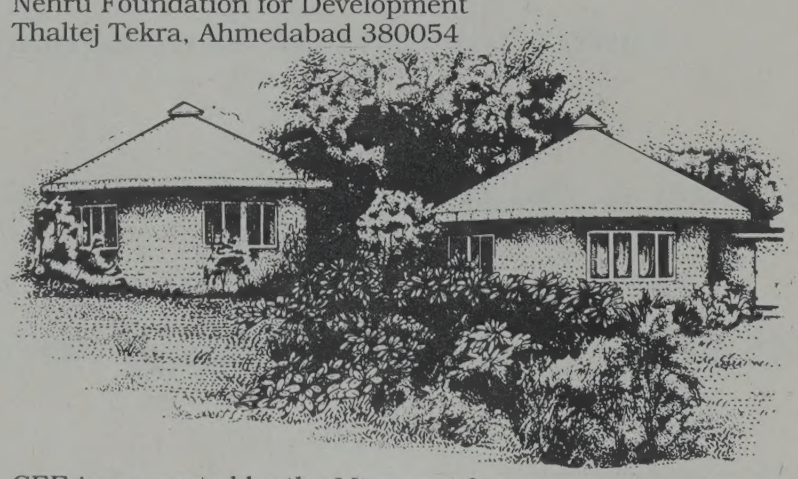
SIKSHA MITRA
(Learning Centre)
Supported by : Swanirbhar
215

Copyright © 1986. Centre for Environment Education, Ahmedabad

Third reprint 1995.

Material from this book may reproduced for educational purposes with written permission from:

Centre for Environment Education
Nehru Foundation for Development
Thaltej Tekra, Ahmedabad 380054



CEE is supported by the Ministry of Environment and Forests, Government of India.

VASCSC programmes are supported by grants from the Government of India (through the NCERT) and the Government of Gujarat

Contents

	Page no.
Foreword	4
Preface	5
Acknowledgements	7
Feedback form	9
Activities	11
Subject areas	87
Thrust areas	88

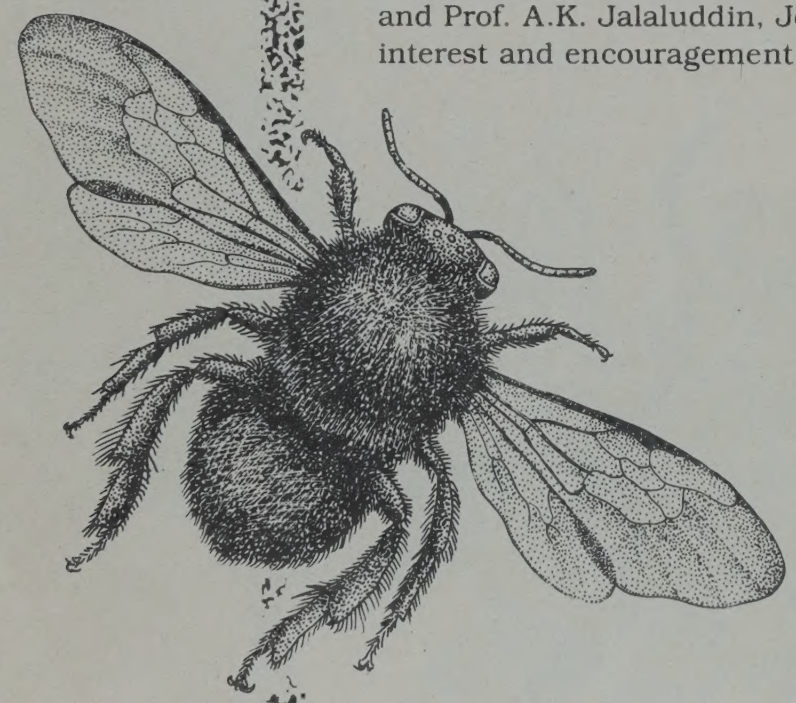
SWAMIRVAR
Estd.-1984
Vill. & P.O. Ambarnath

Foreword

In order to facilitate the implementation of the new Science-related thrust areas in the "New curriculum framework for primary and secondary schools" and new educational policy from the forthcoming academic year, the Department of Education in Science and Mathematics, NCERT, proposed to organise a workshop to develop a handbook of resource materials for the use of Science and Mathematics teachers.

Shri Kartikeya V. Sarabhai, Director, Centre for Environment Education and Vikram A. Sarabhai Community Science Centre, Ahmedabad, very kindly took the responsibility of co-ordinating this project. The present handbook was developed through the workshop which was held from March 18 to 27, 1986. I am thankful to him and all his colleagues and other participants in the workshop for their involvement and hard work. It is hoped that teachers will find this handbook useful. The comments obtained from them after try-out will lead towards the further improvement of the material.

I take this opportunity to thank Dr. P.L. Malhotra, Director, NCERT, and Prof. A.K. Jalaluddin, Joint Director, NCERT, for their approval, interest and encouragement to this programme.



B. Ganguly
Prof. & Head
Department of Education in
Science & Mathematics
NCERT, New Delhi-110 016

Preface

Opportunities for learning exist everywhere. This series of three handbooks is an attempt at showing some ways in which these opportunities can be made use of. They are in no way a complete curriculum, nor do they cover all the different aspects that need to be dealt with at different levels in our education system. Each activitity gives students an experience of a small part of the environment. But these small pieces of experience build into a larger mosaic of understanding. We hope they will provide a framework and approach that teachers can then use to develop a number of activities based on their own local environment and opportunities. The activities have been selected from very different parts of the mosaic of environmental understanding to give a feeling for the tremendous variety of educational activities that can be carried out at the school level.

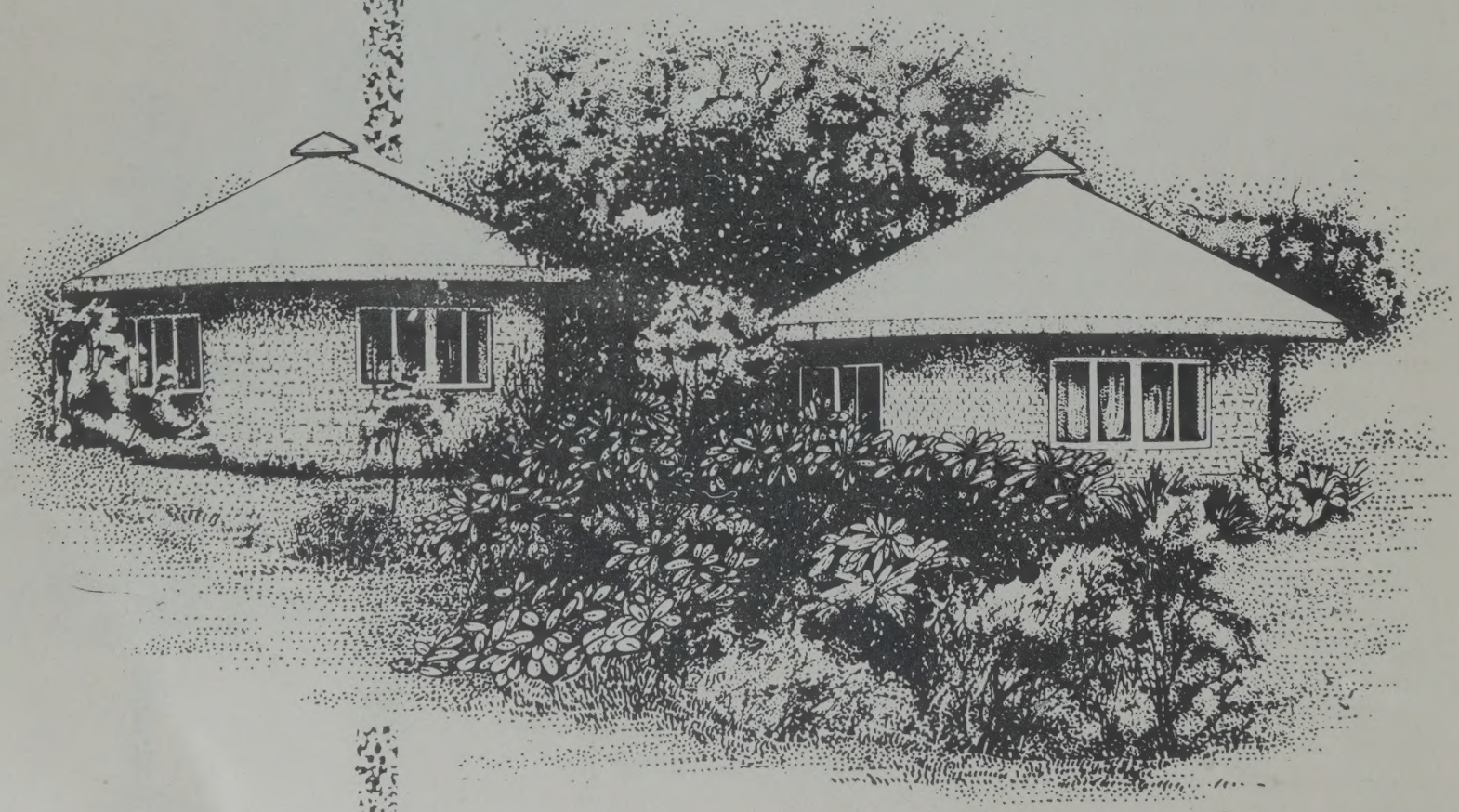
The teacher is the key to the whole education system. It is only through the initiative and innovativeness of the teacher that any such programme can be carried out. The format of the activities calls for a redefinition of what a school activity is and what the role of the teacher is. We hope learning can be more fun when based on experiences both for the student and for the teacher. The teachers' role in these activities is not that of transferring information, but rather one of being a facilitator, a leader and a resource person in a learning process that is participatory. No teacher can be expected to know all the answers, nor should it be required. On many occasions, the teacher should join the students in asking questions and getting the students to discuss how they will find the answer. It is also important to stress that all the "answers" are not yet known. There are many frontiers which are yet to be explored. Many schools in India may not have the resources and reference material to back such programmes. Attempts have therefore been made to keep the need for such material to the minimum. If, however, some additional information is required, the Centre for Environment Education will assist in obtaining it.

The activities have been developed to encourage students to observe and explore, to understand relationships in nature and between man and nature and to know better the functioning of their own bodies and how man is an integral part of nature and more specifically of the animal kingdom.

The New Educational Policy has identified several thrust areas. In the field of Science these include Energy, Environment, Conservation, Wildlife Management, Social Forestry, Agriculture, Industry, Health, Nutrition, Food and Shelter. We felt that the way to introduce these subjects to students is through a Handbook of Activities and not by explicitly adding textbook contents to already overburdened students and teachers. The approach is to give students experiences which will help them to understand better the concepts covered by the thrust areas. The relevance of each activity to the particular thrust area has been indicated on each page. While these activities are primarily to be covered in the Science class, many of them can be carried out in other subjects taught at school. This has also been indicated with the activity.

This volume was produced in an exceedingly brief period of time to meet a circumstantial exigency. The duration of each activity and the suitable time and season for it is, therefore, only indicative. While material requirements have been suggested with each activity, most of them can be done with alternative materials. For planning such an Activities Handbook feedbacks are crucial. We, therefore, hope that you will try these activities and send us feedback as well as suggestions for improvement and outlines of other activities that can be done. We hope this book will lead to "Joy of Learning" - a process in which both students and teachers explore their environment together.

Kartikeya V. Sarabhai
Director, CEE



Acknowledgements

In India national efforts are always overwhelming especially when they are coupled with seemingly impossible deadlines and numbers. When the NCERT requested us to generate in ten days activities which key persons and about five lakh teachers were to try out with lakhs of students in a matter of three months, the task seemed staggering. But the importance of introducing an activity approach in schools and the urgency of creating environmental awareness encouraged us to accept the assignment. We felt we could contribute if only to the extent of getting the ball rolling - of providing an approach and examples of activities that could be tried, discussed and improved upon.

There are groups all over India doing fascinating and innovative work in science and environmental education who, we know, could have greatly contributed to this effort. But there was no time to call people from elsewhere. In the limited time before us we, therefore, put together a team from the associated institutions of the Nehru Foundation for Development at Ahmedabad. The strategy was to develop as many new activities as possible based on the experience of Vikram A. Sarabhai Community Science Centre, Centre for Health Education, Training and Nutrition Awareness (CHETNA) and CEE have proved helpful.

The importance of the task was known and felt by all. The team started working together from the word go. No one grudged working continuously till late at night nor working through Sundays and the festival of Holi. We would like to thank this entire team for its devotion born from a feeling that this effort may mark a step towards revamping the system of uncreative, submissive, rote learning of most of our schools today. We are thankful to the National Council of Educational Research and Training (NCERT), New Delhi, for including us in this effort at reshaping education in India.

We were fortunate in having Professor M.G.K. Menon, Principal Scientific Advisor to the Prime Minister, and Member, Planning Commission, spend time with the participants and for sharing his views on policies and approaches and for his encouragement. Prof. H.Y. Mohan Ram of the Botany Department of Delhi University, kindly consented to spend some time with us discussing a number of activities and approaches. We are grateful to Dr. B. G. Desai of the Gujarat Energy Development authority, Vadodara, Dr. Anand S. Sarabhai of the Bio Centre, Ahmedabad, Shri S.A. Shah of International Tree Crops Research Institute, Vadodara, and Prof. P.R. Pisharoty of Physical Research Laboratory, Ahmedabad, who visited us during the workshop and gave us ideas to work on.

Shri Lavkumar Khachar of the Hingolgadh Nature Conservation and Education Programme, devoted himself to the project as a member of the team.

We would like to thank Prof. B. Ganguly, Professor & Head of the Department of Education in Science & Mathematics of the NCERT, and its Director Dr. P.L. Malhotra, and Joint Director, Prof. A.K. Jalaluddin for having faith in the team and entrusting this work to us.

We now look forward to receiving suggestions and contributions to the next edition of these volumes from teachers, educators, and members of education departments, institutions and voluntary bodies.

The project team

The material in this volume was developed and put together at a workshop jointly sponsored by the NCERT, New Delhi, and CEE, Ahmedabad, held at Sundarvan, Ahmedabad. Participants in this project were:

Co-ordination
Kartikeya V. Sarabhai

Activity Development
Anil Patel, Anjana Bhagwati, Ashok Singh, Atul Pandya, Avanti Mehta, C.J. Sanchorawala, Dhananjay B. Shinde, Dhiraj Bhalani, Dhun Karkaria, E.K. Nareshwar, G. Raju, Hema Karkaria, Himani Desai, K. P. Janardan, Kartikeya V. Sarabhai, Kiran Desai, L. Balasubramaniam, Lalsinh M. Raol, Lavkumar Khachar, M. Abdul Razak, Mamata Pandya, M. J. Ravindranath, Mrinalini V. Sarabhai, Nita Edwin, Rajshree Sarabhai, Ramesh Kothari, Ramesh Uttam, R. P. Dhiman, Samvit Sarabhai, Santosh Kumar Gupta, Shailaja Joshi, Shraddha Vyas, Shrikant Jhaveri, Sonal Mehta, V.B. Kamble, Vivek Khadpekar

Design
Dhun Karkaria, Hema Karkaria

Selection, Rewrite, Editing
Anil Patel, Avanti Mehta, C. J. Sanchorawala, Kartikeya V. Sarabhai, Kiran Desai, K. Shivram, Lavkumar Khachar, L. Balasubramaniam, Mamata Pandya, M.J. Ravindranath, Nita Edwin, Rajshree Sarabhai, Ramesh Kothari, Ramesh Uttam, Santosh Kumar Gupta, Sonal Mehta, V. B. Kamble, Vijay Singh Negi, Vivek Khadpekar

Photography
Bijoy Shivram, Dhun Karkaria, Hema Karkaria, Manoj Dholakia, Rajshree Sarabhai

Illustrations
Dhirubhai M. Thumber, Mahendra M. Dadhania, Mukesh Acharya, Mukesh Barad, Mukesh Panchal, Praful Bilgi, Shailesh Bhalani, Vijay Shrimali, Wilson Solanki

Production
Shailesh Bhalani, Babu Jose, Balamani R. Menon, K. Shivram, Vibhakar Pandya

Support Services
Babu Thakore, Balwant, Bhana Solanki, C. Govindan, Chandubhai Vaghela, Dahyabhai Vaghela, Baldev Thakore, Dilip Thakore, K. V. Suryanarayan, Narayan R. Patel, Natubha Jethwa, P.J. Joseph, P. Rajeevan Nair, Ramdev Pandya, T. K. Balappan

Feedback form

The three volume series of environmental education activities has been prepared in an extremely short time (10 days) to meet the requirements of the teacher training programmes of the NCERT. They are intended for discussion and trial only. Based on feedback and suggestions received, it is planned to bring out the second version of these volumes by January 1987. Your suggestions would be very valuable in preparing these. Please give us feedback on the activities suggested in this volume and also recommend new ones. Due credit will be given for your contribution.

(Please mark '✓' for 'yes' and '×' for 'no' where appropriate in the following form.)

Activity	Have you tried out the activity?	Are the instructions clear?	Is the activity relevant for the level suggested?	Did the activity meet its objectives?	How long did it take to conduct it?	General observations and comments (if necessary attach separate sheet for detailed comments)
1. Pass the pebble						
2. Smells around us						
3. Counting in nature						
4. Birds around you						
5. Paper garlands						
6. Oil and water do not mix						
7. The formation of rain						
8. Waterdrops on leaves						
9. Ripples on water						
10. My tree scrap book						
11. Tree shapes						
12. The floating plant						
13. "Go and touch...."						
14. Tree of life						
15. Floating on water						
16. Vibrations						
17. Track the tracks						
18. Clouds						
19. Geometry around us						
20. Sprout an onion						
21. Cooling off						
22. Shadow play						
23. Body language						
24. Moving naturally						
25. Follow me						
26. Taste maps						
27. A place for me						
28. The "feel" of things						
29. Leaf forms						
30. Tracing shadows						
31. I am a tree						
32. Stable roots						
33. My bird book						

Activity	Have you tried out the activity?	Are the instructions clear?	Is the activity relevant for the level suggested?	Did the activity meet its objectives?	How long did it take to conduct it?	General observations and comments (if necessary attach separate sheet for detailed comments)
34. Find me						
35. Mixing colours						
36. Pick an insect						
37. Soils and soils						
38. More than meets the eye						
39. "See", "saw", "really?"						
40. Making masks						
41. A matter of preference						
42. Making bird baths						
43. Living crafts						
44. Leaf autographs						
45. Aquatic plants						
46. Seasons of trees						
47. Grow up with your tree						
48. The height of it!						
49. Sun, earth & moon						
50. Lamps						
51. Weather report						
52. Starry starry night						
53. Heavy weights						
54. Floating in the air						
55. Sound and noise						
56. Sound and seek						
57. Smell and sound						
58. Swoop in						
59. Energy for work						
60. Colour from vegetation						
61. Insects						
62. The art in hand						
63. Symmetry in nature						
64. Footprints						
65. Water at home						
66. Animals in our lives						
67. Tenants in our home						
68. The things we eat						
69. Energy in the air						
70. Making a whirlwind						
71. Missing numbers						
72. Build a pyramid						
73. Crowding						
74. Nothing for granted						
75. Recycled waste into toys						

PASS THE PEBBLE

1

Objectives

To encourage better perception of nature through touch.

Activity

Have each student collect a stone or pebble and examine it carefully for two minutes, and then put an identification mark on it, for instance a blue square, a red triangle, etc.

The pebbles are handed to the leader who mixes them up and then redistributes them among the students. All the students in the meanwhile are blindfolded. Alternatively, have the participants close their eyes. Each student is to feel the stone passed to him. Each student passes the stone which is not his to the left till he identifies his own stone. At this stage he leaves the game.

The time given to feel a stone may need to be specified if students hold onto a stone for too long.

If many students cannot identify their stones, ask them to get stones which have a special feature which they can feel and identify easily.

Thrust area
Environment

Subject
Science

Place
Outdoor

Group size
10 or more

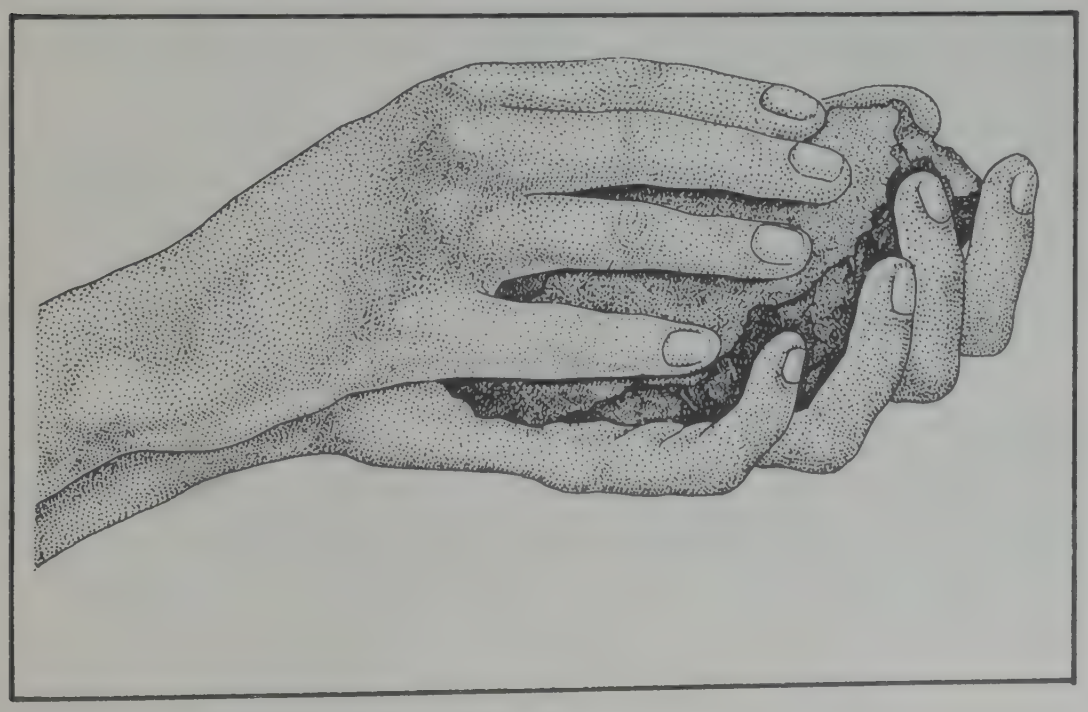
Duration
20 minutes

Suitable time/ season
Any time

Materials
Stones or pebbles, coloured crayons

Variation/extension

- Do this activity with other materials like leaves, barks, etc.
- Explain how touch is very important for finding one's way in darkness.
- Discuss the Braille script and how useful it is for the blind.



2 SMELLS AROUND US

Thrust areas
Health, Pollution

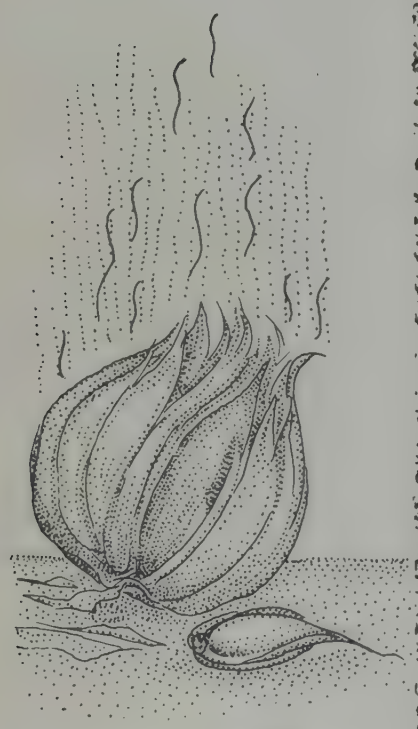
Subjects
Science, Social Studies

Places
Classroom, Home

Group size
Entire class

Duration
30 minutes

Materials
Things that smell



Objectives

Becoming aware of the smells around us, and that each thing has its own smell. The smell that is acceptable to you might be obnoxious to someone else.

Activity

Ask the students to list down as many things as they can which have any kind of smell. (The list can include diverse things such as jeera, champa flower, kerosene, smoke, garbage, sewage, perfume, ghee, etc.) After they have listed them, these can be divided into groups having pleasant, neutral and unpleasant smells.

Ask the students to identify the kinds of smells in their homes and localities. Where do the smells come from? Why? Are they pleasant or unpleasant? If unpleasant, what can be done about them? Have a discussion in which students can suggest solutions.

When all the different smells are listed, you will observe that some smells which are termed neutral by some students are called unpleasant by others. Find such examples by comparing lists in the class and discuss with the students that likes and dislikes in smells are subjective. So we should be careful that our surroundings do not become offensive to others. Students can be made to understand that some objects that give out pleasant smells may also be harmful, such as some gases.

Variation/extension

On the day before, ask each student to bring two objects with any kind of smell. Collect all these and a game can be played with two teams of 10 students each. One student from a team will be blindfolded and made to smell an object given by the other team and identify it by its smell. If he guesses correctly, his team gets a point. The same is then done with the other team and the game continues until all the objects have been smelt.

Find out: Dogs can distinguish many smells that we can't. Which animals have a good sense of smell and which don't?

Evaluation

Make a list of unpleasant smells. Students can find out how these smells can be avoided.

Which objects with unpleasant smells are also pollutants?

COUNTING IN NATURE

3

Objectives

To introduce the concept of quantification and classification as a part of systematic nature observation.

Activity

First ask the students to count things which they can see, starting with small and easy numbers, for example the number of feet a spider has, the number of leaves on a compound leaf, the number of petals on different flowers.

Next go to more complex counting, need for classification and definition, for instance, the number of branches on a tree. Students will immediately come up with definitional problems: Which branch is to be counted? Should they only take the large branches or the small ones as well?

Another activity might be to count the number of cows or bulls in a herd of cattle. These activities bring in the concept of classification.

Now go to impossible counting where estimation is required, for instance, how many birds there are in a flock or the number of cattle in a large herd or the number of trees on a thickly planted plot of land. Thus, in some cases estimation will be done through measuring in a small area and multiplying to cover the full area.

Introduce the concept of measuring time intervals. For instance, students can observe a sparrow's nest and see how often the male and female visit it. They can observe a line of ants and see how many ants pass by a certain point in half a minute. They can count ants going in both directions and see whether the number is roughly the same.

They can count success rates. For instance, how often does the bee-eater or the kingfisher manage to catch its prey. The same thing can be observed looking at a house gecko near the light at night.

Variation/extension

Let two or more students make the same observation and compare their findings. Introduce the concept of error in measurement. This can also be done by the same student counting the same things twice.

Thrust areas
Population, Environment

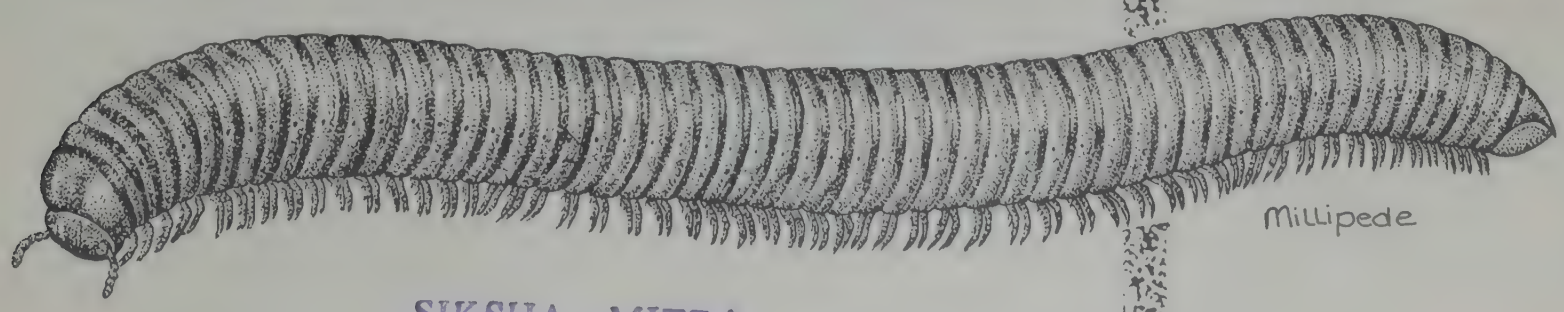
Subjects
Science, Maths

Place
Outdoors

Group size
Group of 2-3

Duration
1 hour

Materials
A watch (optional)



Millipede

215

SIKSHA MITRA
(Learning Centre)
...ted by : Swanirbhar

4 BIRDS AROUND YOU

Thrust areas
Ecology. Conservation. Wildlife. Habitat

Subject
Science

Place
Outdoors

Group size
Individual or group

Duration
A few hours

Suitable time/ season
Any time of the year

Materials
Bird guide

Objectives

To increase students' skills of observation.

To enable them to learn the behavioural and feeding patterns of birds.

Activity

Take the students to a park or any secluded area where it is quiet, where trees and water are present. Divide the class into groups of four or five and let them settle down in different places.

They should close their eyes and sit quietly for five minutes and concentrate on various bird sounds they may hear.

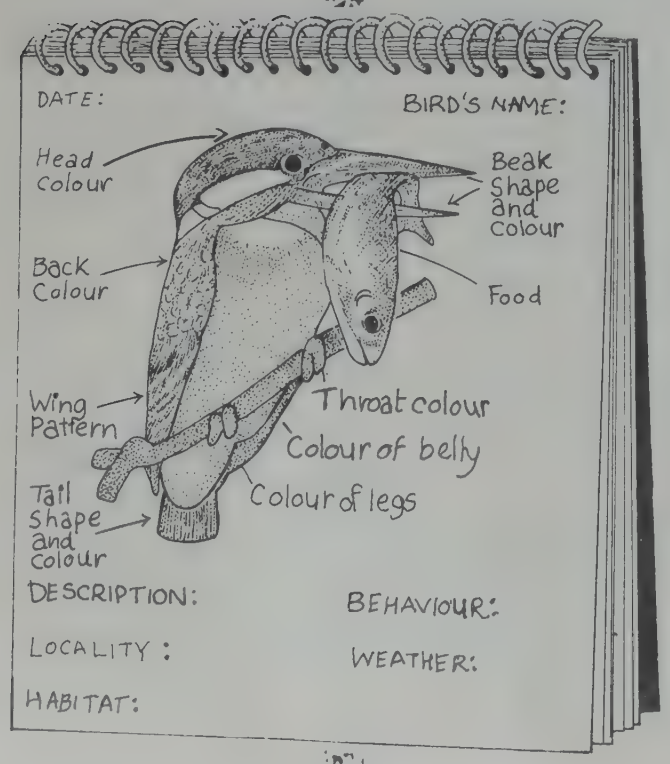
They should then attempt to trace each call to the bird making it and with the help of a bird guide, the bird should be identified.

Having located the birds and identified them, each group should then carefully observe the habits of one particular type of bird which should be assigned to the group by the teacher.

On return to the class room each group should provide their observations to the rest of the class.

Variation/extension

Having got to know particular types of birds, the students should be asked to maintain a diary of regular observations throughout the year.



PAPER GARLANDS

5

Objectives

To make a garland from coloured paper.

Activity

The teacher may ask the students to do this simple but absorbing activity.

Use a pair of scissors to cut circular pieces out of the coloured paper. You can first draw a circle on the paper and then cut along the pencil mark.

Cut each of these circular patches along the dotted lines shown in the figure and pierce a hole at the centre of each piece.

When you have cut several such pieces, pass the string through them and tie the ends of the string together. Your garland is ready.

Would you like to give the garland to somebody?

Variation/extension

- Try making garlands with papers of different colours and with shapes other than circular, like triangles, stars, squares, etc.
- Try making flowers in a different way.
- Can the students make flowers like the ones they see around them?

Thrust area
Environment

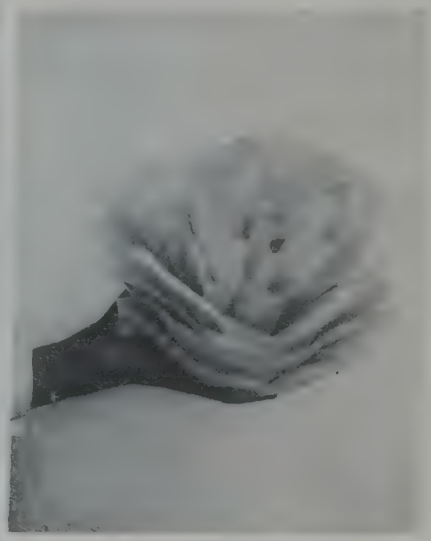
Subject
Craft

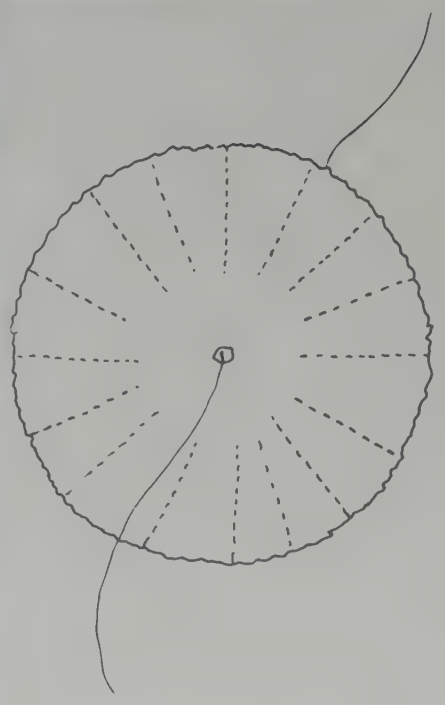
Places
Classroom, Home

Group size
Individual

Duration
30 minutes

Materials
Scissors, thread, coloured paper, pencil





6 OIL AND WATER DO NOT MIX

Thrust area
Wildlife

Subject
Science

Place
Classroom

Group size
Individual, Group

Duration
35 minutes

Material
Brown paper, oil, water, a feather

Cormorant drying its wings

Objectives

To explain how feathers keep birds dry.

Activity

Ask the students to take two small pieces of brown paper and rub oil on one of them. Let them sprinkle water on both the pieces and observe.

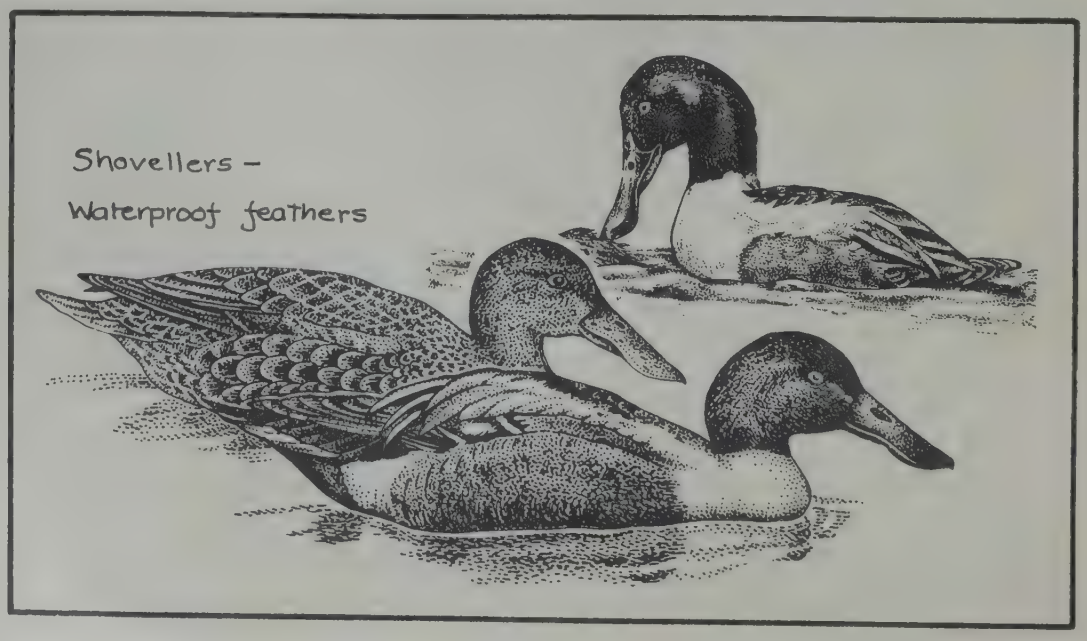
Which piece of paper gets soaked by water and which does not? Discuss the reasons.

Now ask them to sprinkle water over a feather. Discuss the possible reasons as to why the feather does not get wet. Water and oil do not mix. Make the students observe pigeons or sparrows preening and explain that birds have oil glands and they keep applying oil on their feathers with the help of their beak. Tell them where the oil gland is situated. You may also mention that water-birds such as Cormorants and Darters, which do not have oil glands have to dry their wings by holding them outstretched when wet, while ducks which have plenty of oil do not need to dry their feathers.

Discuss this phenomenon is helpful to birds when it rains, or to water-birds such as ducks.

Variation/extension

- Pour oil and water in a transparent glass and see that they do not mix.
- If you go on an outing to a lake see if you can find a Cormorant or a Darter drying its wings.



THE FORMATION OF RAIN

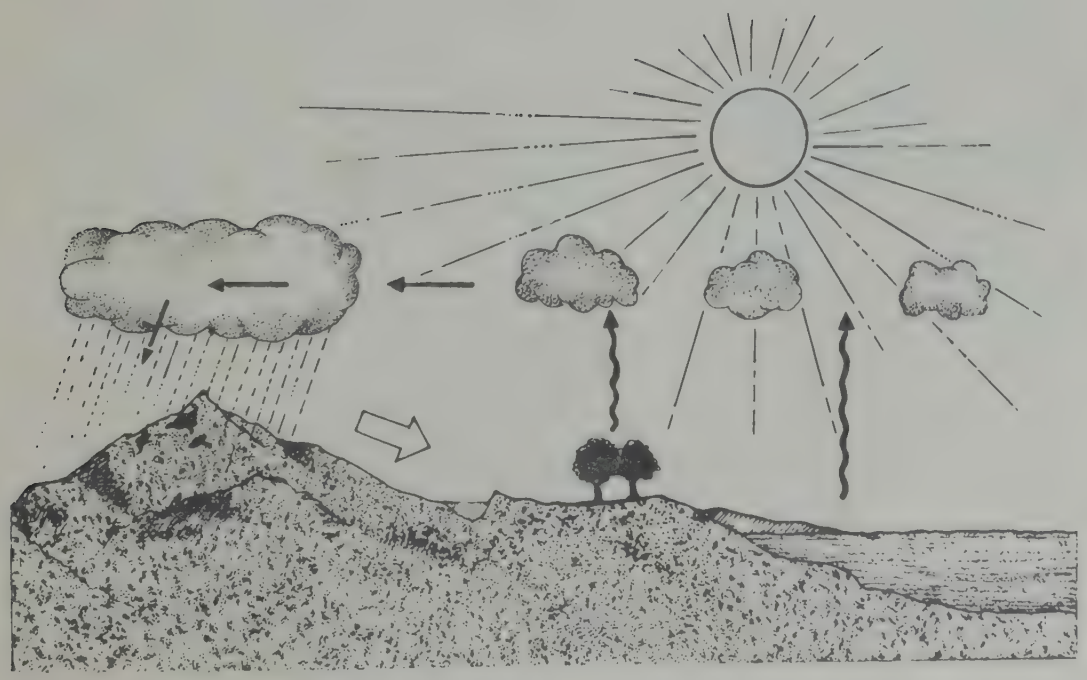
7

Objectives

To give students a better understanding of how water from the ocean, pond, river, etc. comes back to the ground.

Activity

- Ask the students to bring a transparent plastic bag and pour a teaspoonful of water into it.
- Tie the mouth of the bag with the thread.
- Place the bag in direct sunlight.
- Ask the students to observe beads of water forming on the top and sides of the bag.
- Ask them how these droplets got there.
- Transfer the bag to a cool place and ask them to observe what happens to the water droplets.
- Discuss evaporation and condensation of water in nature.



Thrust area
Environment

Subject
Science

Places
Classroom, Home

Group size
Individual or group

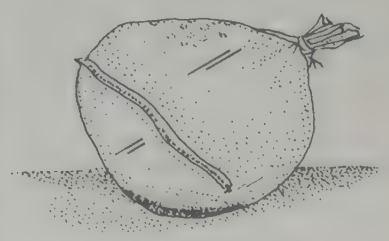
Duration
One hour

Suitable time/ season
Daytime in enough sunlight

Materials
A transparent plastic bag

A piece of thread to tie the bag

Pre-requisites
The student should know that water on earth is in constant circulation called the water cycle. Water from soil, oceans, ponds, leaves of plants, etc. evaporates by getting heat from the sun. In its vapour state, water is carried through air and eventually condenses into small droplets to form clouds and from clouds the water falls back to the ground in the form of rain or snow.



8 WATER DROPS ON LEAVES

Thrust area
Environment

Subject
Science

Places
Classroom, Outdoors

Group size
Entire class

Duration
45-60 minutes

Materials
Leaves from different trees and plants, some water-plants and some land plants, e.g. lotus, water hyacinth, banana, mango

Objectives

To compare what happens to water drops which fall on different types of leaves.

Activity

Take the students to a place where they will come across various plants including water plants. Carry some water with you. Ask the students to take a leaf from each plant and sprinkle few drops of water on the upper surface of the leaf.

Move the leaf gently. See what happens to the water. Students should observe the shape of the drops and how they move on the leaf.

The water may either stay as a drop (like a mercury globule) or spread over the surface.

Repeat this with different leaves. Note what plant the leaf comes from and what happens to the water on its surface.

Does the water drop on the leaves of the water plants behave differently from the drop on the leaves of other plants?

Does the presence of dust on the leaves make a difference?

Variation/extension

Observe how a drop of water behaves on a piece of ordinary paper and a piece of waxed paper.

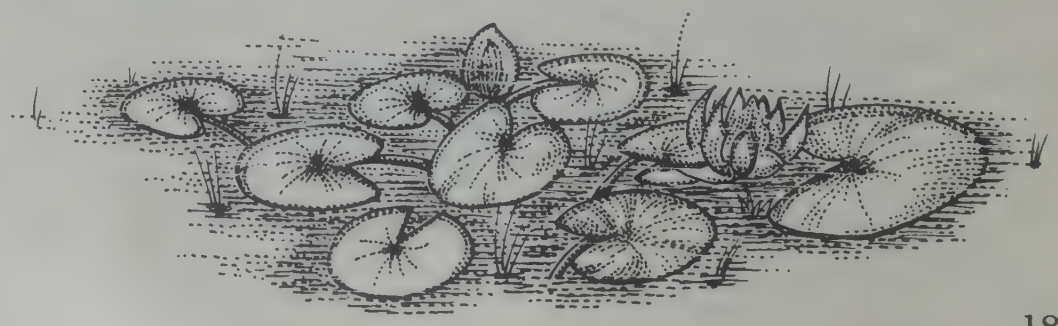
Shapes of drops

Evaluation

Ask the students why the drops of water move freely on the surface of some leaves.

Explain that the leaf has an upper waxy surface. The stomata (openings for breathing) are on the lower surface which is not waxy.

Lotus leaves are often used to pack fresh flowers. As the moisture does not escape from the waxy surface, the flowers remain fresh. This is a traditional practice but has a scientific basis.



RIPPLES ON WATER

9

Objectives

To observe ripples on the surface of water and to investigate their causes and how they move across the water.

Activity

The class should be taken out to a nearby lake, river or seashore.

They should be asked to observe ripples on the water and find out what causes them.

A leaf should be thrown onto the water and attention drawn to the fact that while the waves move on, the floating object remains in the same place.

Waves approaching the shore rise higher and then break by curling over at the crests. This is best seen near the sea or beside a large reservoir when a strong wind is blowing.

The students should discuss how waves or ripples made by wind are different from those made by dropping a pebble into the water or fish coming up to the surface.

Thrust area
Environment

Subject
Science

Place
Outdoors

Group size
Entire class

Duration
45 minutes

Suitable time/ season
Any season

Materials
None

10 MY TREE SCRAP-BOOK

Thrust area
Environment

Subjects
Science, Craft

Place
Outdoors

Group size
Entire class

Duration
On-going

Suitable time/ season
All seasons

Materials
Old notebook (blank paper), pencil, colour box, if available

Objectives

To enable students to identify the different parts of a tree.

To help students understand that the different parts of a tree contribute to its shape.

To develop in students the skills of observation/recording and illustrating.

Activity

Let the students observe a few trees and recognise the main parts of a tree.

Let the students practise drawing/sketching the main parts of a tree separately.

After the students have finished drawing the main parts, let them look at different types of trees, e.g.,

- trees which are tall or short
- trees with maximum and with minimum branches
- trees with many leaves or few leaves
- trees with large leaves or with small leaves, etc.

and observe the variations.

The students can be encouraged to discuss among themselves how the different parts of a tree contribute to its shape.

The students can be asked to sketch the shapes of the trees highlighting the positions of the different parts.

Paste the sketches in a scrap-book.

Students should cut colour pictures of different types of birds and insects from old magazines, and stick these at appropriate places on the sketches of trees they have made.

Variation/extension

The trees the students have observed should be checked by them at different times of the year, and notes kept of the changes observed.

The students should be encouraged to reason out the various factors that may have contributed to these changes.

TREE SHAPES

11

Objectives

Learning to identify shapes of trees from a distance.

Activity

Take the students to a place where they will be able to see several different types of trees. Ask the students to stand at a distance from a tree so that the whole tree is visible.

Ask them to observe the shape and spread of the tree and its branch formation. Let them sketch the outline of the tree, and describe what shape it reminds them of.

Repeat with other trees of the same type. Does the pattern remain the same? Now make observations of trees of different types. Encourage students to classify trees by overall shape.

They may describe the shapes of the trees by comparing them to familiar objects and shapes such as a lollipop, umbrella, pole, cone, triangle, or inverted triangle.

Ask them to name as many trees as they know and classify them according to shape.

Variation/extension

Does the shape of the tree alter if several trees grow very close to one another? Can you suggest why?

Evaluation

Can the student identify a tree at a distance?

Thrust area
Forestry

Place
Outdoors

Group size
Groups of 2-3 or individual

Duration
30 minutes

Suitable time/ season
Any season when the trees are in leaf

Materials
Paper, pencil

12 THE FLOATING PLANT

Thrust area
Environment

Subject
Science

Place
Outdoors

Group size
Entire class

Duration
30 minutes

Suitable time/ season
Monsoon preferably

Materials
Pond with water Hyacinth plant, accessibility to a pond or lake where there are Water Hyacinths present, hand lens.

Objectives

To see how and why the Water Hyacinth plant is buoyant.

Activity

Water Hyacinth may be observed in a pond or lake where water is available throughout the year.

Ask the students to observe the plant. They will observe that it floats.

Take out a plant and pass it around the class for a closer observation of its structure. They can do this by feeling the stem gently. Is it soft and spongy? How does this help to keep the plant afloat?

The fleshy stem is bulbous and hollow with air sacs inside. These get filled with air, and this is what makes the plant buoyant.

Take a rubber tube 30 cm long. Tie both ends of the tube tightly with string. Attach a heavy stone to one end of the tube. Place the tube in a bucket of water. What happens to the tube?

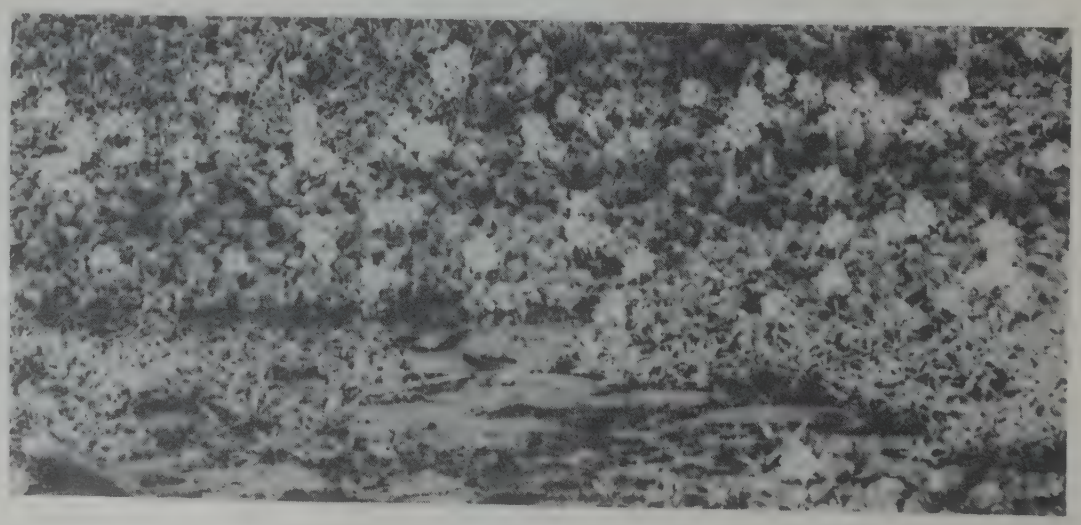
Variation/extension

You may show the students the cross-section of the stem. Provide a magnifying glass for observation of the air sacs.

Evaluation

Ask the students, what features of the Water Hyacinth plant help it to float on water?

Can you think of other plants whose flowers and leaves stay afloat using the same principle?



"GO AND TOUCH....."

13

Objectives

To make students aware of the various living things, the colours associated, and their parts.

Activity

Form two or three teams of the students. Ask each team to sit in a straight line. Each team should have a captain, who will maintain order in his team. The captain will also keep one member of his team ready to answer the call of the instructor.

You can explain to them that the game is to listen carefully to the instructor and when the instructor calls "GO AND TOUCH....", one member from each team kept ready by the captain rushes out to touch the named object, and after touching, returns to his seat. Whichever member reaches his/her place first gets one point. The others do not get any point. Then the next 3-4 members — one from each team — are asked to "GO AND TOUCH....." Members who have already gone and touched an article are asked to sit at the end of their line so that everyone in the team gets a chance to participate.

This game can be like any other game except to make it an Environment Education Activity — the instructor should ask children to "GO AND TOUCH..."

A living thing green in colour, a living thing red in colour, the bark of a tree, the leaf of a mango (or any other) tree, grass, water, stones, dried leaves, seeds, a flower, a plant, an animal, a fruit, food.

When every team member has participated, then the points won by each team should be totalled and whichever team has the highest score wins the game.

To ensure that the student looking for the object he has to touch uses his own powers of observations, you must forbid his team-mates from helping him in any way like pointing out the object to him.

You can make the game more effective by calling out an object to be touched and then pointing with your hand in a direction in which it is not present. This will further enhance their power of observation.

Variation/extension

Teams could be asked to touch things which pollute the habitat.

Teams could be asked to touch different trees to assist in identifying trees.

Call out items which need really keen observation skills on the part of the student for him to be able to find it out.

Thrust area
Habitat

Subject
P.T.

Place
Outdoors

Group size
Entire class

Duration
20 to 25 minutes

Materials
None

Pre-requisites
Children know a little bit about plants, trees, rocks and colours.

14 TREE OF LIFE

Thrust areas
Ecology, Wildlife

Subjects
Science, Maths

Places
Classroom, Outdoor

Group size
2 to 3

Materials
Paper, pencil

Objectives

To make students aware that trees harbour a rich and complex variety of life.

Activity

Ask each student to select a tree for himself and observe it carefully. The students should draw an outline of the shape of the tree to mark what they see on it.

They should note down whatever life they are able to see on or around that tree. They should note down the details like : what types of birds, insects and other animals did they see on the tree and where? How many were there? Did they notice any nest? What were the birds, animals, insects doing?

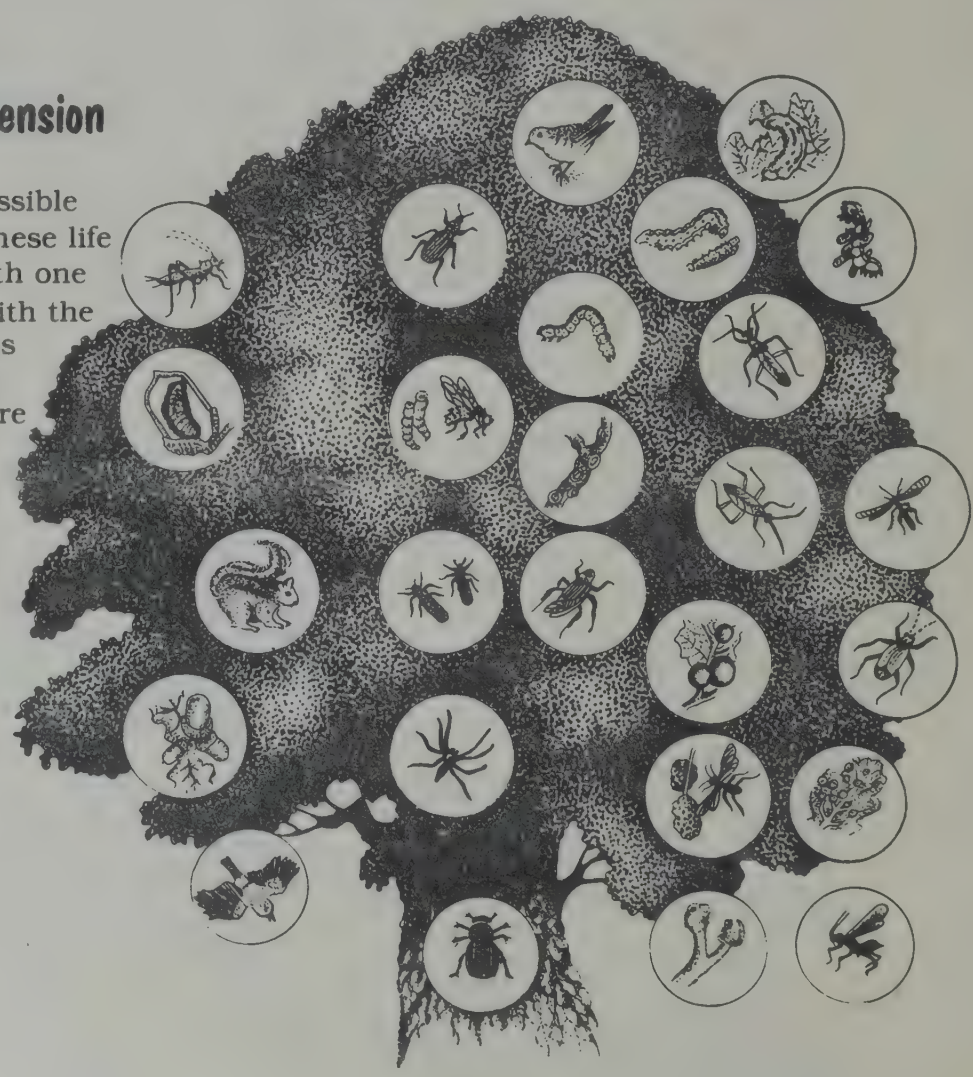
The students may go for observation more than once to notice the patterns of life on and around the trees.

They should then return and present their drawings to the class.

Which kinds of trees have a greater variety of life on them and why?

Variation/extension

Discuss the possible relationships these life forms have with one another and with the tree. Draw lines connecting the things which are inter-related.



FLOATING ON WATER

15

Objectives

To find out how insects float on water.

Activity

Take students to a pond or still water body and show them floating insects.

Ask the students the following questions:

- How do these insects float on water?
- Why do they not sink?

Then ask them to do the following:

Fill a glass or tumbler with water. Take a blade and put it in the water vertically. Note what happens.

Now remove the blade and dry it thoroughly. Take a small piece of blotting paper or newspaper smaller than the mouth of the glass. Place the blade on it horizontally. Then place the paper and the blade very gently on the surface of the water. Observe what happens. When does the paper sink? What happens to the blade?

Variation/extension

The same experiment can also be done with a needle instead of a blade.

Evaluation

Through this experiment students understand the role of surface tension which enables some animals and objects to float on water.

Thrust areas
Ecology, Wildlife

Subject
Science

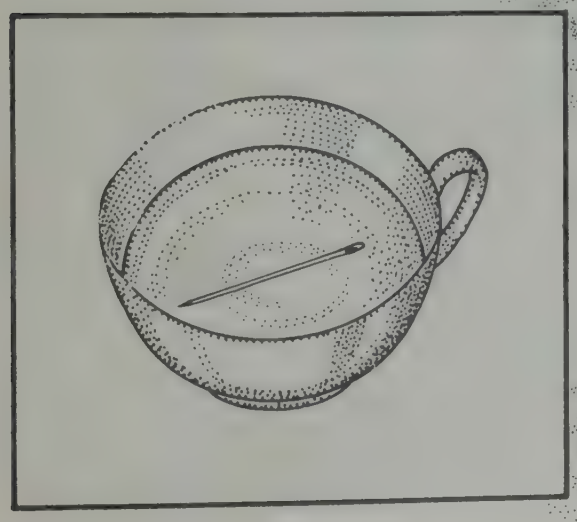
Places
Classroom, Laboratory, Outdoors, Home

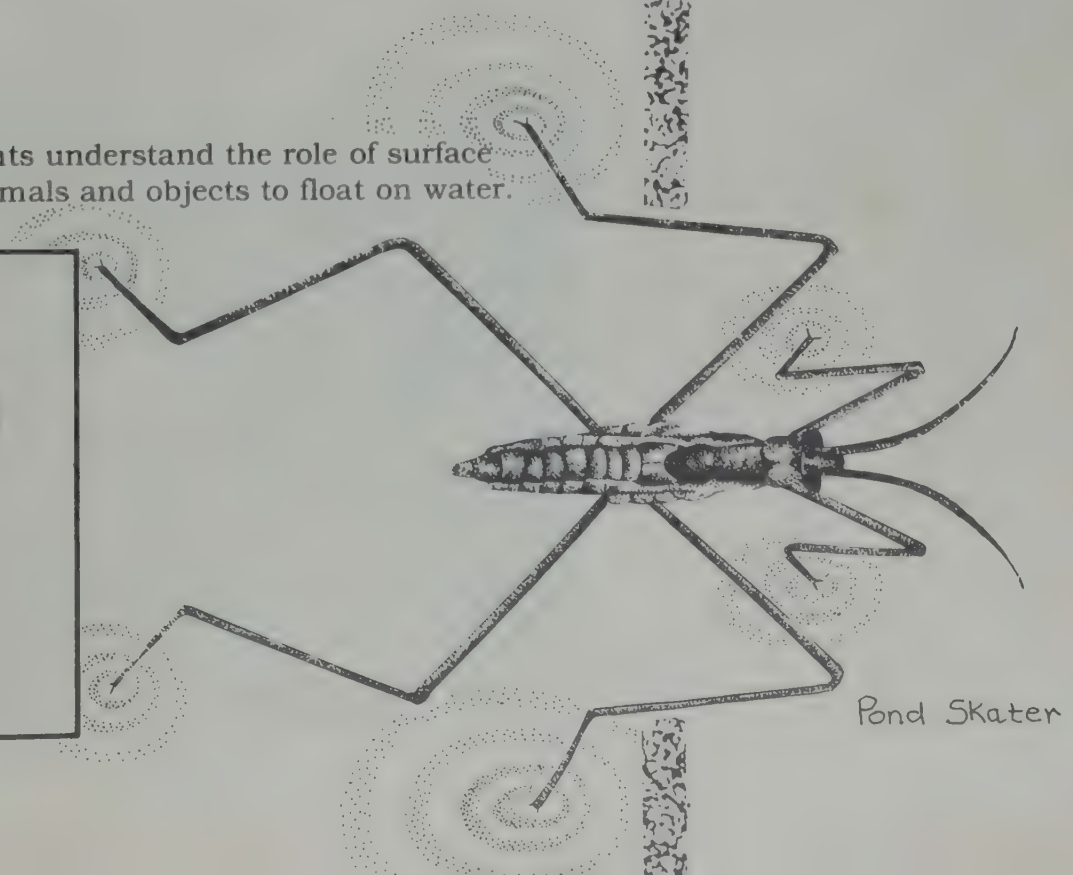
Group size
Individual or Group of 4 or 5 students

Duration
20 minutes

Materials
Shaving blade, needle, blotting paper, glass.

Pre-requisite
They should know how to handle the materials properly.





Pond Skater

16 VIBRATIONS

Thrust area
Wildlife

Subject
Science

Place
Outdoors

Group size
Full class

Duration
30 minutes

Suitable time/ season
After monsoon

Materials
Dough
Puffed rice

Objectives

To make students aware of senses in other animal forms — in this case fish.

Activity

The students should be taken to a pool or riverside where there are plenty of fish, preferably a temple or a mosque pool where the fish are accustomed to human presence.

First make a small pellet of dough and gently slip it into the water without creating ripples or wetting your fingers. Observe that only a fish which sees the sinking pellet will come to it. Other fish further away show no response.

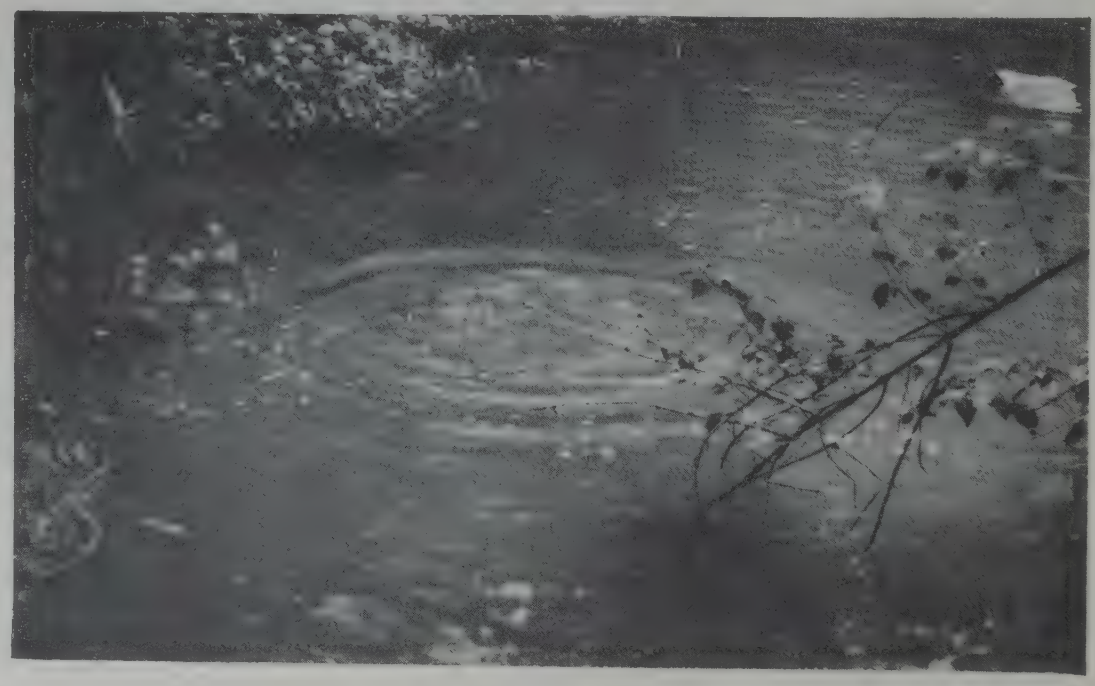
Now make small pellets of dough and throw them into the water. The students should observe how the fish converge on the spot where the dough had been thrown.

After that throw more pellets with greater force and demonstrate to the students that more fish congregate; thereby deducting that the fish come from a greater distance.

The students should now try the same exercise individually observing the greater response to stronger vibrations. Subsequent discussions on the observations should be conducted.

Variation/extension

Try the same exercise with puffed rice and discuss the observations.



TRACK THE TRACKS

17

Objectives

- To increase observational powers in students.
- To identify marks on the soil.

Activity

Take the students to a pond and divide them into small groups of 3-4. Ask them to tread softly, disturbing as little as possible, in the area around the pond.

While the students are near the water, ask them to observe closely (with the help of a magnifying glass, if available) the soil which is slightly damp.

Students should look for small holes in the soil. They should then observe quietly and carefully if anything is going in or coming out of the holes.

Students should also look for tracks or other marks left on the soil near the water and try to guess whether these marks/tracks are made by:

- insects
- birds
- small animals (squirrel, mongoose, slugs, snails, etc.)
- large animals (cows, buffaloes, dogs, etc.)
- reptiles (snake, lizards, etc.)
- human beings

Students should sketch the different types of tracks/marks in their note books, identify as many as they can, and describe the rest.

Students can also make a print of their own foot or hand on the soil.

Variation/extension

The activity can be done at the seaside, on a river bank or in a river bed.

Evaluation

The following questions can be addressed to the students.

- Why are there holes in the soil?
- Why are there tracks on the soil?

Thrust areas
Ecology, Wildlife, Habitat

Subjects
Science, Craft

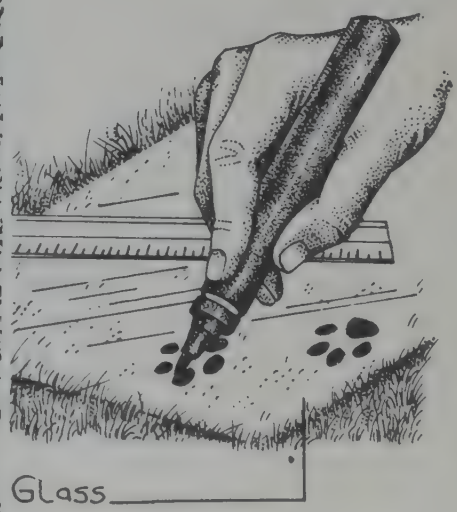
Place
Outdoors

Group size
3 to 4

Duration
30 minutes

Suitable time
When the soil around the pond is slightly damp

Materials
Paper, pencil, magnifying glass, if available.



18 CLOUDS

Thrust area
Environment

Subjects
Science, Craft

Place
Outdoors

Group size
Entire class

Duration
As long as desired

Suitable time/ season
Monsoon or when clouds are visible

Materials
Paper, pencil

Objectives

To observe cloud patterns in the sky.

Activity

Take the students out on a cloudy day, and ask them to watch the sky and the clouds.

They must observe the clouds for their patterns, shapes and sizes, and their movement across the sky.

Each student may choose a cloud and make a sketch of it. Students may do several such sketches, and make an album of these.

Ask students what they are reminded of by the shapes and movement of the clouds.

Ask them if they can tell rain-bearing clouds from other clouds. Which seasons do they see clouds in?

Variation/extension

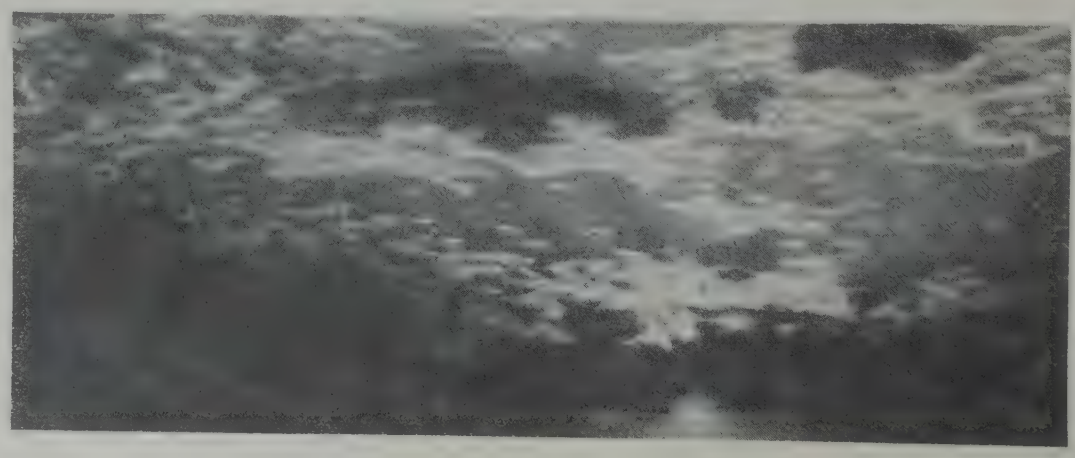
You could talk about the various types of clouds and their names.

Further reading

- Source book of Science Teaching, UNESCO

Evaluation

Ask students on cloudy days whether they think it is going to rain? Keep a record of the predictions.



GEOMETRY AROUND US

19

Objectives

To make students aware of geometrical shapes in the environment.

Activity

Ask the students to relate various geometrical shapes to things they observe in their environment which includes their homes, classroom or natural surroundings outdoors. Let the students go out of the classroom for about 15 minutes to observe these shapes. Let them list objects under each geometrical shape. Get them to draw familiar animals and things using combinations of geometrical shapes.

Variation/extension

Ask the students to make models of a house, a bird etc. using cut-outs of these shapes.

In the Himalayas, pupils should look at freshly fallen snow flakes through magnifying glasses and see their shapes.

Thrust areas
Habitat, Environment

Subjects
Science, Maths

Places
Classroom, Outdoors, Home

Group size
Individual

Duration
30 minutes

Materials
None

Pre-requisite
Students are aware of geometric shapes like triangle, line, square, circle, oval, rectangle, hexagon etc.

20 SPROUT AN ONION

Thrust area
Agriculture

Subjects
Science, Craft

Places
Classroom, Home

Group size
Individual or 2-3 students

Duration
Approximately 2 weeks

Materials
One onion, 3 toothpicks or matchsticks, small glass of water.

Objectives

To observe the process of sprouting in onions.

Activity

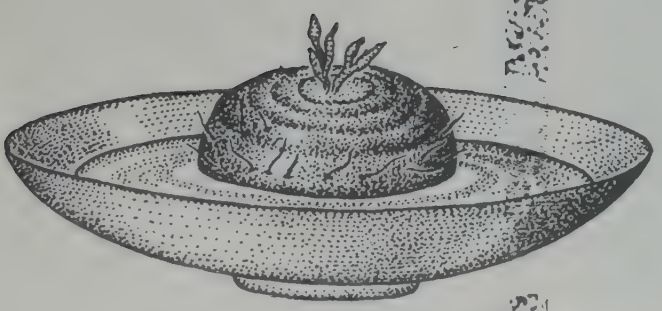
Stick three toothpicks or sharpened matchsticks into the base of an onion and place it in a glass of water so that only the lowest part of the onion is actually in the water.

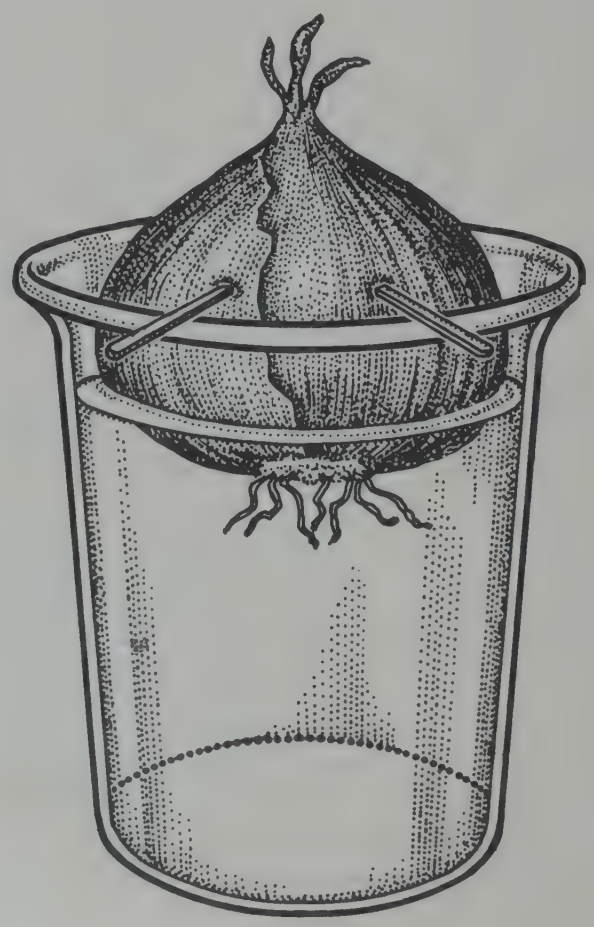
Leave it on a sunny window sill and add water whenever necessary.

The onion will soon sprout and send up green leaves.

Variation/extension

- Try this activity with potatoes, sweet potatoes, carrots, etc.
- Ask students whether sprouting can take place without water.





COOLING OFF

21

Objectives

To introduce to students the concept that the body, in order to maintain uniform temperature, needs to have mechanisms for cooling off.

Activity

Ask the students to name some ways of staying cool in summer. They may mention going into the shade, or sitting under a fan. Discuss with them how the body itself has mechanisms to keep cool. Let them feel the air which they breathe out. Is it cool or warm? Let them hold a loose fist to the mouth and blow in and out through it. They will immediately feel the difference in temperature of the air passing in and out. Explain how this is one way in which the body stays cool. Make the students run fast. When they stop, they will start panting. The reason for panting is that the body has generated a lot of heat and needs to cool faster.

Explain how perspiration is another method by which the human body stays cool. Let them lick the back of their hand and blow on it. That part of the skin will feel cool. Explain that evaporation does a similar thing.

Variation/extension

Ask them to say how common domestic animals keep themselves cool. Talk about the buffalo which needs to lie in water for several hours or the dog which keeps panting with its tongue hanging out. If references are available, you may like to discuss how wild animals keep themselves cool.

Thrust area
Environment

Subject
Science

Place
Classroom and outdoors

Group size
Entire class

Duration
30 minutes

Materials
None

22 SHADOWPLAY

Thrust area
Environment

Subject
Science

Duration
One day

Suitable time/ season
Any cloudless day

Materials
Ruler or measuring tape

Objectives

To understand how the lengths and directions of shadows vary according to the position of the sun.

Activity

A few days prior to carrying out this activity the teacher should ask the students to observe the shadows cast by them at different times of day when walking to and from school, when playing outdoors etc. They will quickly register that shadows are long when the sun is low and short when it is high.

Now ask them to select a pole, a tree or any other object which it is possible to observe at frequent intervals throughout the day.

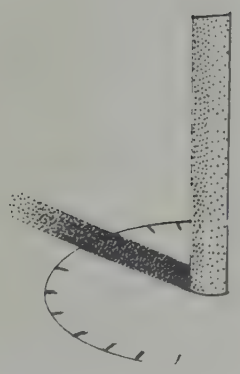
Let them mark the length and the direction of the shadow before the first period of the day, and again after every period. Any one student at a time can go out and do this so that the schedule of classes is not disrupted.

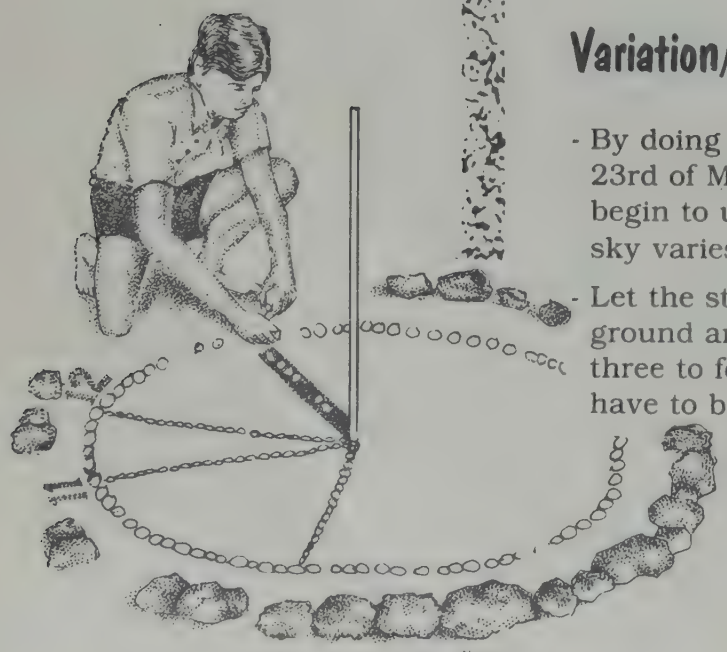
At the end of the day take out the whole class to see the result of the day's work. At the end of each shadow mark you may put down the time at which that reading was taken, i.e. the time at which each period began or ended.

Now ask the students:

- What was the time when the shadow was the longest?
- At what time was the shadow shortest?
- What time was noon?

The students may repeat this activity over the next two or three days to find out if the positions and the lengths of the shadows vary at the given points in time.





Variation/extension

- By doing this exercise four times in the year, i.e. on or around the 23rd of March, June, September, and December, the students can begin to understand how the apparent track of the sun across the sky varies around the year.
- Let the students build their own sun-dial by driving a stick into the ground and marking its shadows by the hour. This can be used for three to four weeks to tell the time. After that correction factors will have to be applied.

BODY LANGUAGE

23

Objectives

Learning to use one's body in the proper manner from childhood. This has an effect on developing the mental capabilities of the individual.

Activity

This is to study the flexibility of the body.

Students are first given simple movements like what is standing, sitting, jumping, crawling, running, squatting, lying, etc. The body can do these things even without being taught.

The wonder that is the body should be emphasised.

Gradually through games they can be led into the details of standing with the spine erect. For instance, make them lie flat, feel the earth and then ask them to stand exactly like that. Tell them about the spine. A story of the Dashavataras can be acted showing the various stances.

Discuss with students how animals do similar movements. What can animals do that we cannot and what can we do that animals cannot?

Ask the students to jump like monkeys or like deer or like frogs. How do they land on their feet? How do we?

Do similar activities with crawling, running, etc.

Variation/extension

Show the students how the body reflects moods. Make them pretend to cry. The head goes downwards, the hands cover the face. Make them laugh. The head is up, the hands free. Later, it can be linked up with little scenes, or even the nine Rasas of Indian drama. There are many imaginative possibilities.

Thrust areas
Energy, Health

Subject
Performing arts

Place
Classroom

Group size
Entire class

Duration
60 minutes

Materials
Charts of Yogic postures may be shown.

24 MOVING NATURALLY

Thrust area
Wildlife

Subject
Performing arts

Group size
Entire class

Places
Classroom, Outdoors

Duration
30 minutes

Materials
None

Objectives

Creating awareness of body movements in nature.

Activity

The teacher tells the class a story. As an example, a story about a forest.

They come across various animals. Start with the most common. Perhaps a frog. Study the way a frog moves. Discuss its movements. Is it the same as a lizard's? Is it the same as a butterfly's? Let the students see and act out the difference.

In this way the students individually and in a group act out the movements of animals and birds. Encourage students to produce appropriate "sounds" to go along with their movements.

Observation is essential here. The teacher should point out the differences and the similarities.

Variation/extension

Poems and stories of animals may be enacted giving the children the freedom of choice. Some may make up little stories. The whole exercise is not only to observe but to kindle the imagination.

Further reading

Stories of animals and birds and nature from classics like the Panchatantra, Hitopadesha, Jataka stories, folk stories from all regions of India and from around the world.

FOLLOW ME

25

Objectives

To enhance sensory perception (other than sight) in examining the environment.

Activity

Let students form pairs. Blindfold one in each pair. Ask each pair to walk through a series of obstacles like a ditch, or tree or an overhanging branch with the partner who can see, leading. If obstacles are not available, these can be created with marks on the ground, posting volunteers to be trees, or using furniture.

The partner who leads should do so without talking. For instance, he may take the hand of his blindfolded partner and make him feel the obstacles.

After a while, the roles in each pair should be reversed.

Variation/extension

- Instead of pairs have the whole group form a chain with blindfolded students alternating.
- Everybody except the leader in the chain should be blindfolded.

Thrust areas
Conservation, Habitat

Subject
P.T.

Place
Outdoors

Group size
Entire class

Duration
30 minutes

Materials
Blindfolds for all

Pre-requisites
Chalk out the trail in advance

26 TASTE MAPS

Thrust area
Health

Subject
Science

Place
Classroom

Group size
3 to 4

Duration
30-40 minutes

Materials
One glass each, of the following solutions:

- *Sugar*
- *Salt*
- *Vinegar or lime*
- *Neem leaf juice or Bitter gourd juice*

Cotton swabs (four per student) on the tips of toothpicks or any suitable thin sticks.

Objectives

To demonstrate that sensitivity to the four different basic tastes is concentrated in different zones on the surface of the tongue.

Activity

Draw a sketch of the tongue (as shown) on the blackboard and number the zones.

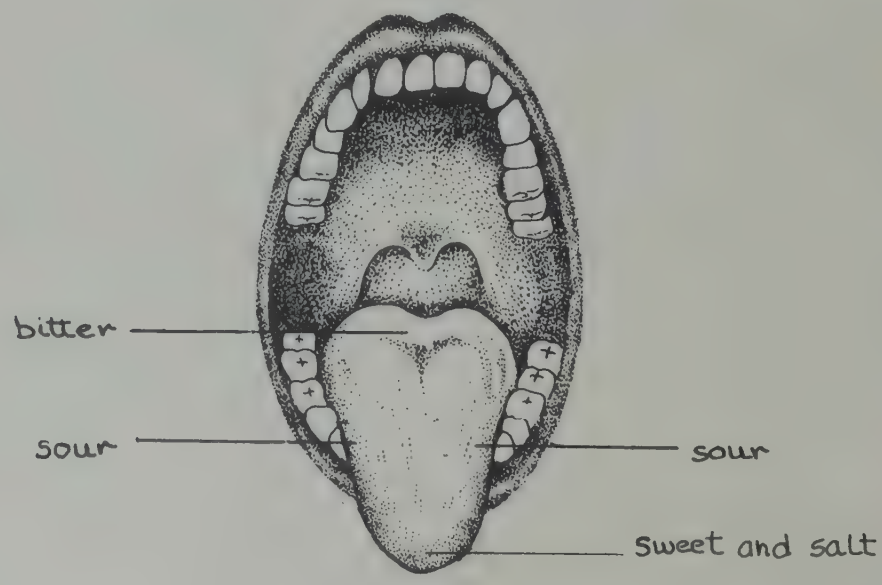
Place one of the four glasses of solution on a table. Ask each student to dip a swab in the glass, apply it carefully to each of the four zones on her tongue and note down on a piece of paper which of the four tastes (sweet, sour, salty and bitter) it was and in which zone its sensation was most prominently felt. Let the student rinse her mouth with plain water.

Repeat this process with the remaining three glasses, one at a time.

At the end of the experiment, ask the students to compare notes and identify which zone is most sensitive to which taste. Let them each draw the taste map and colour the zones for the different tastes, assigning one colour to each taste.

Variation/extension

Besides tasting, what are the other functions of the human tongue? How do animals use their tongue? Discuss frogs, dogs, snakes, cows, snails and cats.



A PLACE FOR ME

27

Objectives

To make students understand the effect of water on the surrounding temperature.

To make them sensitive to microclimatic changes around them.

Activity

Take students to a pond.

Ask them to approach the pond slowly. Do they feel a difference in temperature as they move towards the pond?

If there is a breeze, let them stand in different directions around the pond and see if they can sense temperature differences. Ask the students to gauge differences in temperatures at other places.

They can stand under a tree, crawl under a bush, climb onto a tree. They can put their hand into the water at the surface and deeper down. They can put their hands under a stone and on the stone's surface. Dig a small hole in the soil and compare it to the surface layer of soil. Are there differences in temperature?

CAUTION: There may be scorpions or snakes under stones.

Thrust area
Habitat

Subject
Science

Place
Outdoors

Group size
Entire class

Duration
60 minutes

Materials
None

Variation/extension

Introduce the concept of microclimate — the climate in a very limited space explored by the students. Ask them to relate each of these spaces with the insects, birds or other animals that inhabit that space.

28 THE 'FEEL' OF THINGS

Thrust area
Environment

Subject
Science

Places
Classroom, Outdoors

Group size
Entire class

Duration
30 minutes

Materials
Commonly available objects or vegetables and fruits.

Objectives

To enable the students to recognize materials by touch.

Activity

Let a few students in the class be blindfolded. Place the objects on a table and ask the students to feel these and classify them into groups such as.

- Rough or Smooth
- Rounded or Sharp-edged
- Hard or Soft
- Hot or Cold

Repeat with other students.

Later ask them to suggest more names of items which fall in these groups. They may be asked to organise their observations in a tabular form.

Can they suggest a few things which are partially rough and partially smooth? Ask them to make a list of these things.

Variation/extension

- Ask the students to draw the objects bringing out the qualities they have described.
- Such activities can be done based on other senses, using different objects.

LEAF FORMS

29

Objectives

To observe plants and leaves and know more about their shapes and forms.

Activity

Ask students to collect leaves from their surroundings.

Let them group these leaves according to their respective edges —

Spiky edges; Wavy edges; Smooth edges

Are leaf edges of the same type of plant always the same?

Instruct them to put these leaves between sheets of old newspapers. When these leaves are dry, they can paste them on a hard paper and write the name of the plant or tree below each of them.

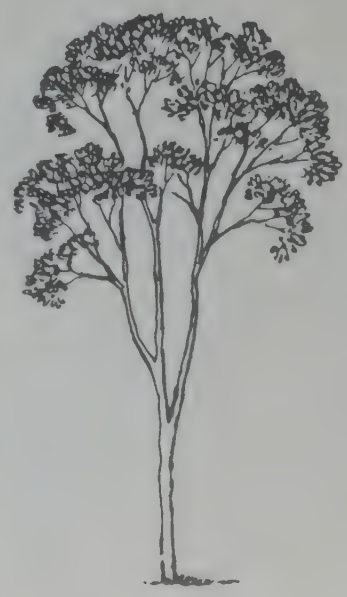
Thrust area
Environment

Subject
Science

Place
Outdoor

Group size
Individual

Materials
Leaves from different plants, old newspapers, hard paper, gum, pencil



30 TRACING SHADOWS

Thrust areas
Environment

Subjects
Science, Craft

Place
Outdoor

Group size
2 to 3 or individual

Materials
Paper, pencil

Objectives

To encourage greater association with the environment.

To enhance graphic skills.

Activity

Making pictures by means of shadows:

Let the students go out into a garden/farm or woods with a blank sheet of paper and pencil.

Let them observe plants, trees and other objects that cast shadows.

Let them select a particular shadow. It may be a small branch or a similar object. Let them place a blank paper on the spot where the shadow falls.

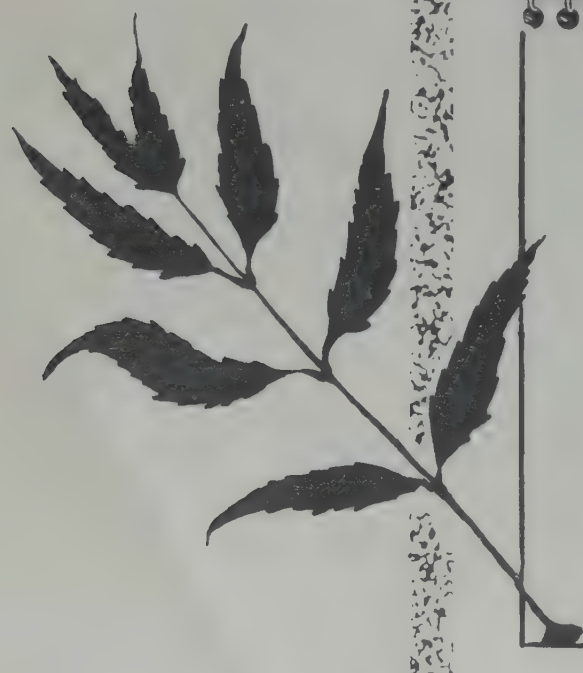
Instruct them to trace the outline of the shadow.

They can select several natural objects. At home also they can trace shadows from interesting man-made objects, selected from their environment.

Variation/extension

They can choose a fixed object (e.g. water tap or wood stump) and make a record of its shadows on ground at different times of the day.

Make hand shadows and silhouettes.



I AM A TREE

31

Thrust areas
Forestry, Conservation

Subject
Performing arts

Place
Classroom

Group size
10-15

Duration
15-20 minutes

Materials
Music optional

Objectives

Identifying oneself with a tree and imagining its response through acting.

Activity

Ask the students to act out what happens to a tree when there is a

- Gentle breeze
- Violent storm
- Forest fire
- Squirrel running up its trunk
- Person plucking leaves and fruits
- Person carving on its bark
- Shower of rain
- Child climbing it
- Man watering it
- Person cutting it

This activity would be very effective if there was some music with it.

Variation/extension

Students should observe trees during the year in as many of these conditions as possible.

32 STABLE ROOTS

Thrust areas
Agriculture, Forestry

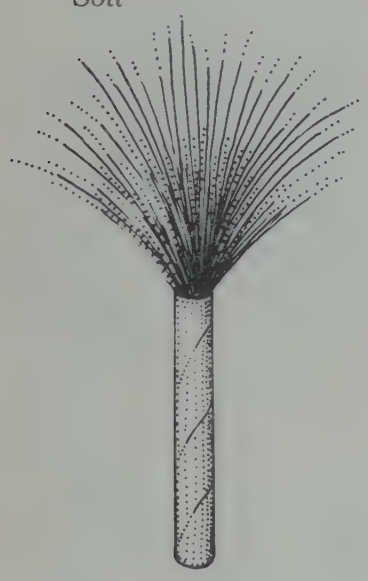
Subjects
Science, Craft

Place
Classroom

Group size
Groups of 2-3

Duration
40 minutes

Materials
Cardboard
Straw
Glue
A tray
Soil



Objectives

To make the students aware of the importance of roots for the stability of trees.

Activity

Ask the students to make small tree models using cardboard or card paper. They may stick pieces of straw or coloured paper to the models. They should be asked to make a number of trees of different sizes and shapes.

After they have made the trees ask them to place these on the table. Most of the trees will not stand. Discuss this with the students. Ask them what is missing from their models.

The students would normally make the tree models without roots. Ask them to make roots using string or straw and stick them to the model. Now they can take some earth in a tray and plant their "trees" to make a little forest.

Use this activity to start a discussion on roots.

Variation/extension

- The other functions of roots could be explained to the students.
- Show them different types of roots.
- Ask them if there are some roots which we eat.

Evaluation

Let them make a list at home of the roots that people eat.

MY BIRD BOOK

33

Objectives

- To enable students to identify the external features of a bird.
- To help students identify different types of birds by observing the external features.
- To develop in students the skills of observation, recording and illustrating.

Activity

Let the students go out and observe a few birds. Let them identify the different basic features of a bird, such as,

- beak
- body
- neck
- head
- feet
- wings
- tail
- feathers
- eyes

Teach the students how they can draw these different features (separately) using simple form diagrams (as illustrated).

Ask the students to go out and observe different birds and note the variations in colour, size and other external features and record them.

The students should draw the diagrams of the birds observed, using the form patterns.

The students should colour the diagrams using crayons (as close to the colour of the bird as possible)

The student should stick all the drawings in a scrapbook.

Thrust area
Ecology, Wildlife, Habitat

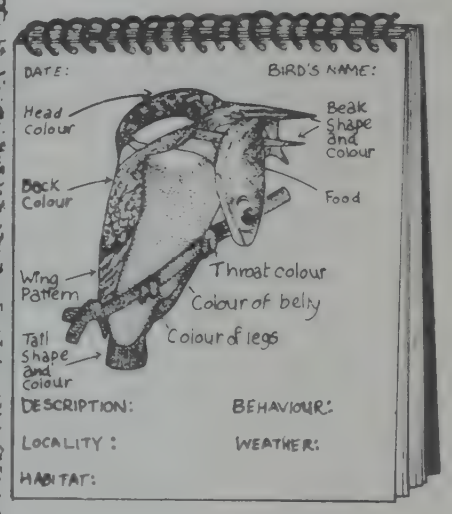
Subject
Science

Place
Outdoors

Group size
Individual

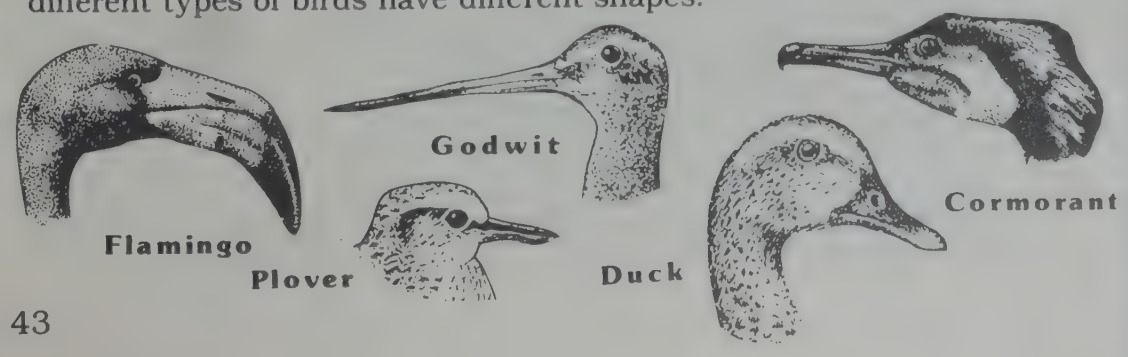
Duration
On-going

Materials
A notebook (blank paper), pencil, crayons (if available)



Variation/extension

- The students can be asked to compare the shapes of beaks and feet of different birds and interpret the comparisons in terms of their feeding habits.
- Students should be encouraged to discuss and reason out why different types of birds have different shapes.



34 FIND ME

Thrust areas
Ecology, Wildlife, Habitat

Subjects
Science, P.T.

Place
Outdoor

Group size
Any number

Duration
30 minutes

Suitable time
Any time

Materials
Strips of paper approximately 6 cm × 3 cm, pottery pieces from pots or matka may also be used, paints, colour pencils or crayons

Snipe

Objectives

To introduce the principles of camouflage.

Activity

Divide the students into 2 teams. Give each student a strip of paper. Ask them to wander around and decide on a place where they would like to place their paper strip so that it is not easily noticed. Make them colour the paper in such a way that it merges with the background and becomes hard to distinguish from the object, on or near which the paper strip has been placed.

Example: A student may want to place her strip on the bark of a mango tree. How would she make her paper look like the bark of a mango tree?

Ask the students to write their team number on the back of the strip of paper. Make the students in team A place their strips of paper on the object or place they have chosen and return. The strips may not be easily noticeable but must be visible. Ask team B to go and find team A's strips of paper. How many did they find?

If some are still not found, hints may be given about their location to make it easier to find.

Then get team B to 'hide' the paper strips and team A to find them.

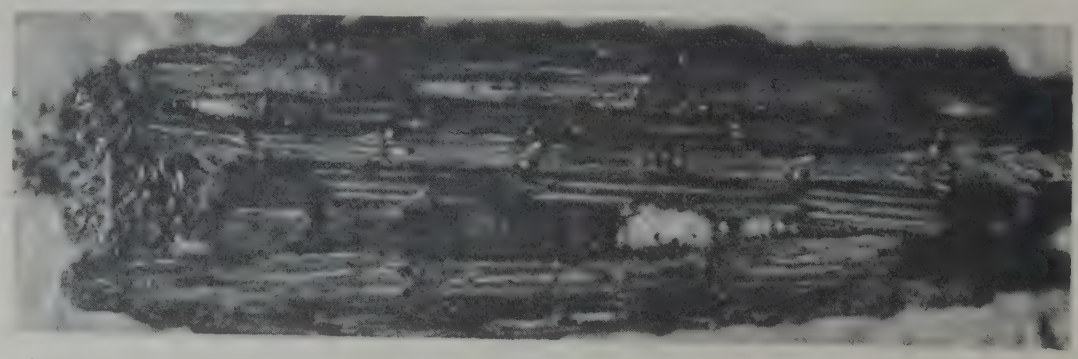
The team which finds the most paper strips wins.

Variation/extension

Discuss with the students how animals, birds and insects use this technique to hide themselves. Introduce the term 'camouflage'.

Evaluation

Ask students to name some animals, birds and insects that camouflage themselves. Why do they camouflage themselves?



Bagworm larva

MIXING COLOURS

35

Objectives

To make the student familiar with the principles of colour mixing and to develop in the student skills for making simple science projects related to environment.

Activity

The students take a piece of paper and paste on it petals, leaves and paper pieces of different colours like red, yellow, light green, pink, blue, etc.

They then place a piece of coloured cellophane (red, blue, yellow, etc.) over each colour, one after the other. Let the students now observe colour changes due to mixing of colours.

Take the cellophane paper and observe things outdoors.

Variation/extension

Filters can be made by students from cellophane paper pieces.

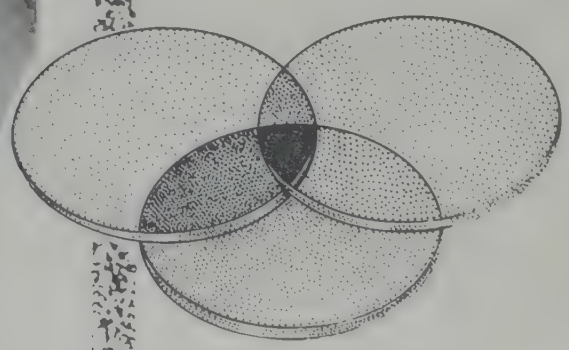
Thrust area
Energy

Subjects
Science, Craft

Places
Classroom, Outdoor, Home

Group size
Individual

Materials
Piece of coloured cellophane (red, blue, yellow, etc.), white paper, natural coloured material like flowers, leaves, etc.



36 PICK AN INSECT

Thrust area
Wildlife

Subject
Science

Places
Classroom, Outdoor

Group size
Any

Duration
30-45 minutes

Materials
Coloured card paper, scissors

Objectives

To enable students to understand the advantages of protective coloration in living organisms.

Activity

Cut card paper into small strips and colour them on both sides with the same colour. Use a variety of colours including in-between shades by mixing colours. These are the "insects". Scatter these around on the grass.

Give each student a name of a bird, e.g. green bee-eater, crow, etc.

Then call out the names of these birds, one at a time. As each species is called out, the student representing the bird can "fly" out over the area where the "insects" are scattered and pick up the first insect which catches the "bird's" eye.

As students return from their "flights", ask them to lay out on a piece of white paper, the paper insect they picked up. Make sure they are placed in the same order that they were picked up in.

Repeat this process until each student has made at least one return "flight".

Then ask the students to consider the colour sequence of the "insects" picked up.

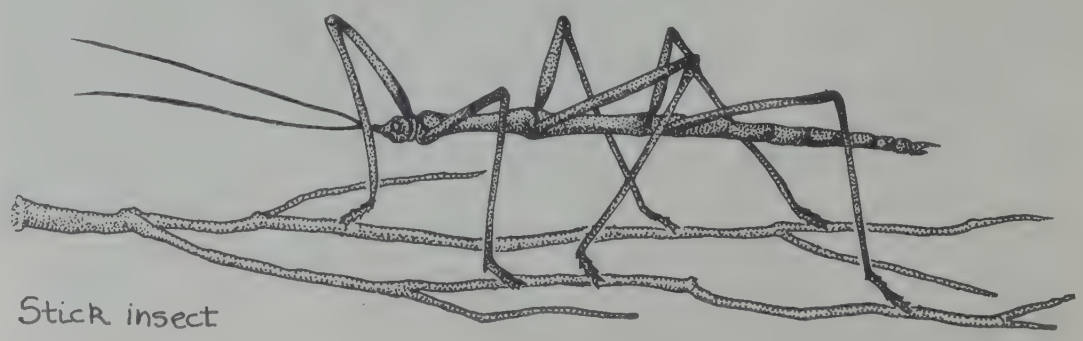
You will observe that those having a similar colour as the background will be picked up last, and those with a different colour tend to be picked up first.

Now try the game in the playground or where there is bare soil.

You could discuss with your students how colours help protect the insects from being caught or killed.

Variation/extension

From the 'insect', the colour protection phenomena in birds and animals too could be explained.



Stick insect

SOILS AND SOILS

37

Objectives

To observe and understand that soil is composed of different materials. Also, that different soils have different compositions.

Activity

Ask the students to do the following activity—

Collect different types of soil — say from the school ground, a natural path, a garden, under a tree, from a pond's edge, etc.

Place each type in a separate bottle, filling each bottle up to half its height. It is important that they are all filled to the same level. Label each bottle mentioning the source.

Now add water so that it comes up to 5 cm above the soil level. If possible, measure the water before pouring it in so that the amount of water each soil absorbs can be recorded.

Put the lid on the bottle and mix the contents by shaking. Let the bottles stand for more than two hours.

Now mark on the bottles, the different levels where the heavier particles, the lighter ones and the ones that float occur. Note the different colours of the various levels.

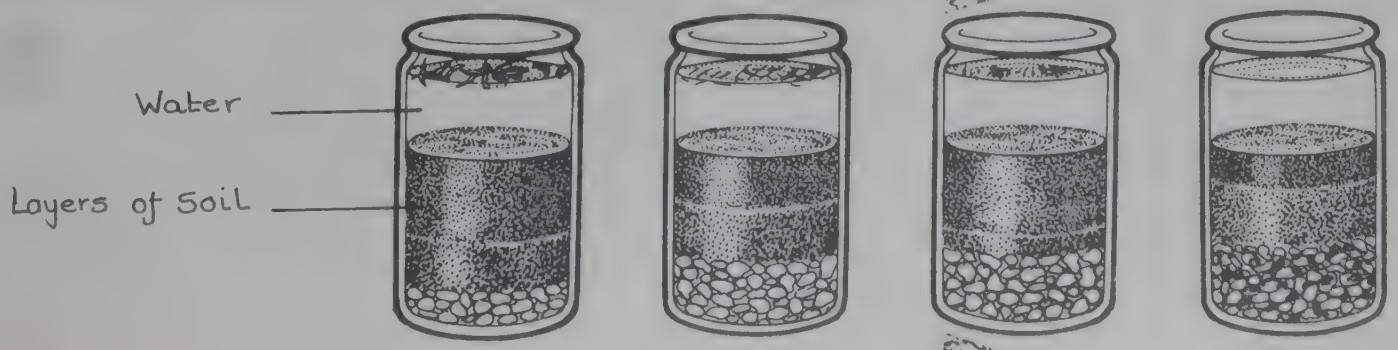
Measure each depth with a ruler. All this, from marking to measuring, should be done without disturbing the bottles. Ask the students to discuss their findings with others.

Variation/extension

- Weigh the same volume of each type of soil and note the differences.
- If more time is available, open the lid and allow the water to evaporate before marking the layers.

Evaluation

Do students understand that soil is made up of different components?



Thrust area
Environment

Subject
Science

Places
Classroom, Home

Group size
Entire class

Duration
60 minutes

Materials
Wide-mouth bottles of the same size with lids, measuring scale, water.

38 MORE THAN MEETS THE EYE

Thrust area
Pollution

Subject
Science

Places
Classroom, Home

Group size
Individual, Groups of 2 to 3 students

Duration
One day

Suitable time/ season
Wherever there is bright sunlight

Materials
Transparent drinking glasses or empty bottles, saucers, salt

Objectives

To create among students an awareness that water contains dissolved and undissolved substances and to introduce the concept of water pollution.

Activity

Ask the students to collect water in glasses or transparent bottles from different sources like a pond, water tank, stream, tap, etc.

Tell the student to observe each.
Is the water clear or murky?
What colour is the water?

Is anything seen floating on the water surface or in it? Tell the student to grade the water : clearest, clear, murky, very murky. Observing two glasses at a time is a good method of comparing the water in them.

Let the water stand for 30 minutes and then ask the student to observe it again.

Has anything settled at the bottom of the glass?

Ask the students to place equal amounts of water (say 20 teaspoonful) from the glasses into separate saucers. Place the saucers in direct sunlight until the water evaporates.

Is there a residue? What could it be? Why could they not see it before?

Variation/extension

Ask the students to take a glass of drinking water and dissolve a teaspoon of salt in it. Evaporate the water in direct sunlight. Once the water has evaporated, ask the students to taste the residue.

"SEE", "SAW", "REALLY?"

39

Objectives

To increase the power of concentration while observing as objectively as possible.

To encourage retention of one's observation.

Activity

Collect about 30 items from nature without harming the living things. Put these on a large plate or tray and cover them with a cloth so that they cannot be seen.

Ask the students to gather around the tray. Remove the cloth for a short duration (say 10 seconds or more, according to age group). Cover the tray. Now ask the students to list all the items they have seen.

Variation/extension

Add 10 to 15 man-made items like cloth, nail, pen, pin, etc. Ask the students to make separate lists for natural and man-made items.

Make it a team game with each team consisting of not more than 4 students. Also ask the teams to describe the items in terms of size or dimensions, outstanding characteristics, colour, shape, texture, similar to or different from any known objects, where found, etc.

Evaluation

Students should be able to recall at least 50% of the items displayed and list them.

Thrust area
Environment

Subject
Science

Place
Classroom

Group size
5-7

Duration
15 minutes

Materials
30 to 50 items from nature like feather, stone, shell, leaf, twig, soil, fruit, flower, dry leaf, fungus, etc. A large cloth to cover these

40 MAKING MASKS

Thrust areas

Wildlife.

Subjects

Science, Language, Craft, Performing arts

Place

Classroom

Group size

2 to 3 or individual

Duration

A day or a week depending upon the complexity of the mask

Materials

Thick paper, used brown paper, newspaper, flour paste, inks, scissors

Pre-requisites

Familiarity with basic craft materials.

Objectives

- To make students aware of the facial features of different animals through mask making.
- To understand the behaviour patterns of animals by enacting them.

Activity

Ask the students to take card paper or make a thick card by pasting 5-6 pages of old newspaper together with glue and placing it flat on the ground to dry in sunlight. After the paste is applied on paper A, paper B will be pasted on it and then papers C, D, E and F, etc.

Once the thick paper is ready, draw a simplified form of the front face of the animal on the card. The form outline should be bold.

Cut out the form with a pair of scissors and attach tie-strings to the mask.

Students can be asked to develop ideas about making masks of other birds, animals, trees, flowers, and fruits.

Use of materials to make the mask three dimensional can be encouraged, e.g. horns and ears of a cow, beaks of birds. Colouring the masks makes the activity more interesting and also generates keen observation. When the masks are ready, ask the students to enact the bahaviour of the animal portrayed. This activity has tremendous scope for learning with fun.

Variation/extension

- Students can be given creative writing and costume designing assignments in relation to nature.
- Encourage them to act out animal stories.

A MATTER OF PREFERENCE

41

Objectives

To get students to do a simple experiment of putting food at different places to see where ants come most.

Activity

Ask the students to locate an area where ants are seen. Find a shaded spot and one where there is bright sunlight. Put small amounts of crushed jaggery or sugar at both the spots. Care should be taken that both locations are equidistant from the ants' hole.

Wait and watch the ants. Notice where they collect.

Ask students to note down observations.

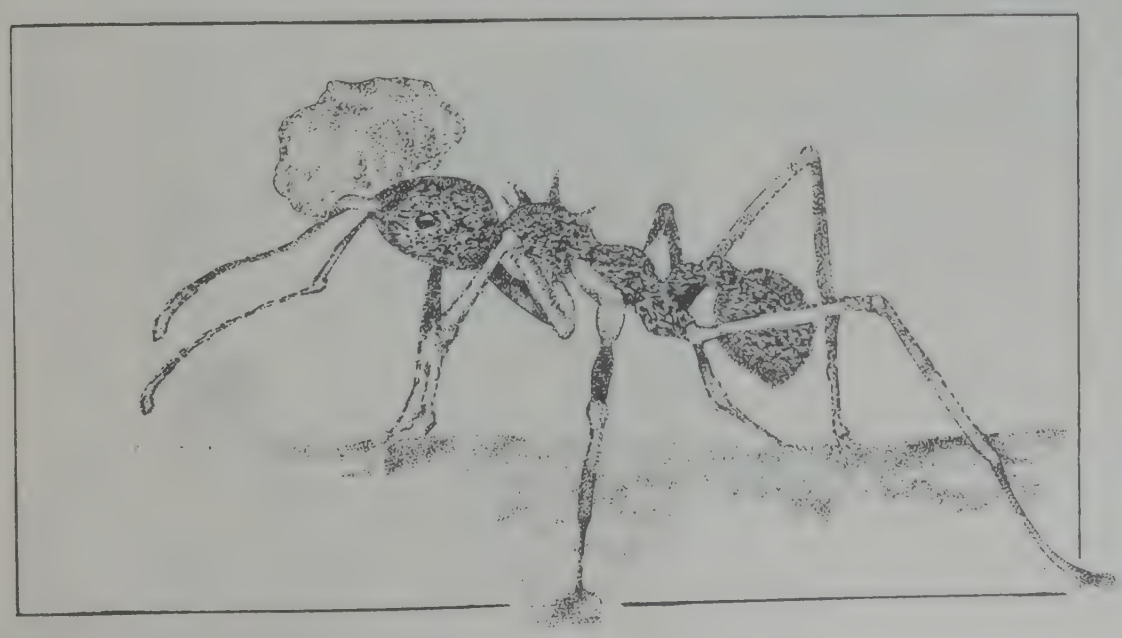
After the ants start swarming, ask the students to make a small ditch around the sugar. Notice what happens.

Subsequently put some sugar in different locations, e.g. high off the ground, hung from a tree wrapped up in a leaf, etc. Observe whether ants get to the sugar.

Put sugar in two cups and place these in saucers, one of which is filled with water. See what happens.

Variation/extension

How would you keep food away from insects?



Thrust area
Ecology

Subject
Science

Places
Outdoor, Home

Group size
2 to 3

Materials
Crushed jaggery or sugar

42 MAKING BIRD BATHS

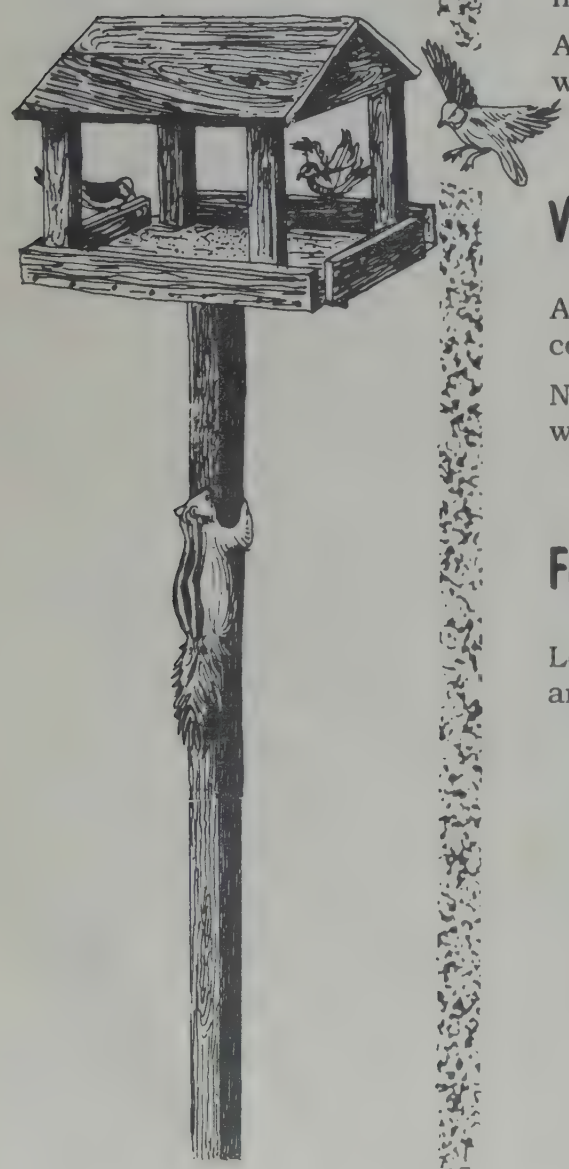
Thrust areas
Conservation, Wildlife

Subjects
Science, Social Studies, Maths, Craft

Places
Classroom, Outdoors, Home

Group size
5 to 6

Materials
Clay pans or metal pans, strong wires, large nail and hammer



Objectives

- To encourage students to take interest in birds.
- To provide an observation spot for better understanding of bird life.

Activity

Let students take a shallow clay pan.

Using the nail and hammer make holes in the pan as indicated in the figure.

Tie lengths of wire through these holes and hang up the bird-bath in a tree or from a rafter of the verandah. This will keep them safe from cats which might kill the birds coming to drink and bathe.

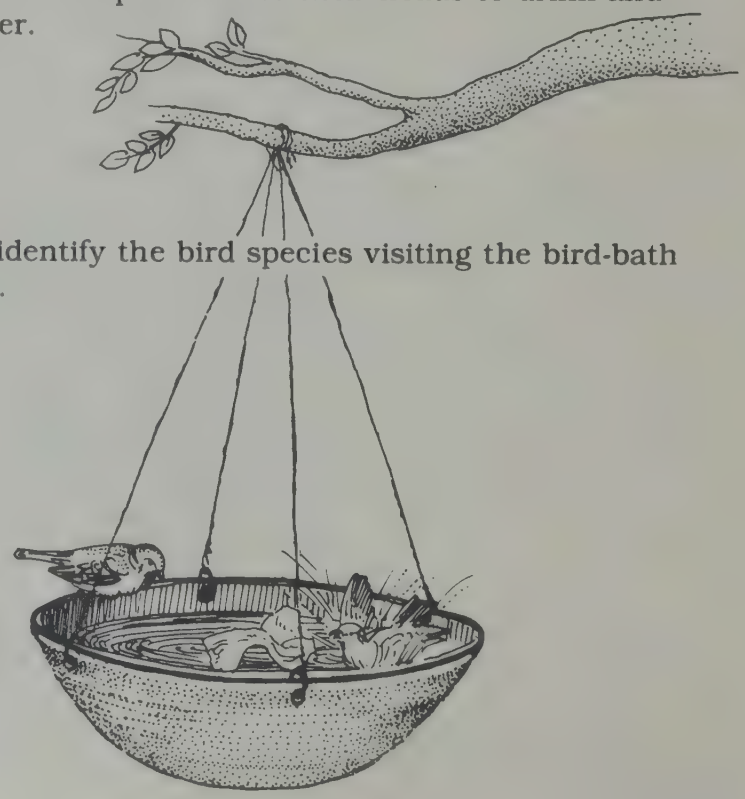
Ensure that the pan is cleaned every morning and kept filled. Students should observe the birds visiting the bird-bath and make notes of their sizes and shapes.

Along with the bird-bath, a feed-place can also be constructed to watch what food which bird takes.

Variation/extension

Ask students to draw birds, noting the important features, e.g. size, colour, shape of bill, etc.

Notes may be made of which species raise their heads to drink and which suck up the water.



Further reading

Look up bird books to identify the bird species visiting the bird-bath and the feeding station.

LIVING CRAFTS

43

Objectives

To utilise living plant material for a craft project.

Activity

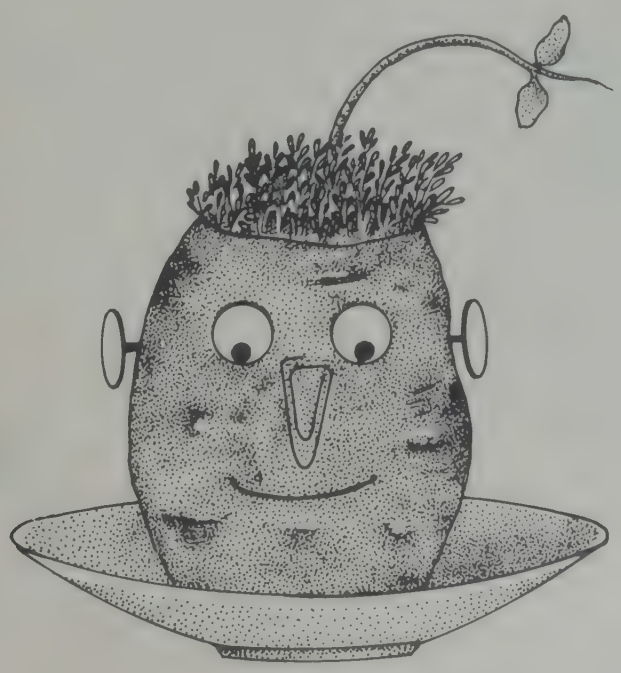
Ask the students to form into small groups of two to three. Each group should take a small earthen pot or an empty coconut shell if available. This should be filled with earth. Ask the students to paint these pots, so that they resemble human heads. Now place the heads on a window-sill or any other place where they are exposed to sunlight.

The students should then plant different seeds such as mustard, beans, moong, etc., of their choice in the "head" and water them periodically.

See the funny green "hair" growing on the heads.

Variation/extension

- One can do this experiment by using potatoes or other vegetables instead of an earthen pot. Scoop a hollow in the vegetable and line the cavity with cotton or earth, plant the seeds and place it in a dish of water after painting the human head.
- Students can make a small model of a house and place it in a tray containing earth. They can then plant a garden around it by sowing different seeds and see it bloom.



Thrust area
Environment

Subject
Craft

Places
Classroom, Home

Group size
Group of 2 to 3 students

Duration
2 weeks

Materials
small earthen pot or fresh coconut with its top sliced off, seeds, soil

44 LEAF AUTOGRAPHS

Thrust areas
Forestry, Environment

Subjects
Science, Craft

Place
Outdoors

Group size
Entire class

Duration
30 minutes to 2 hours.

Suitable time/ season
All seasons

Materials
Paper and wax-crayons, or needle and thread, or water colours, or charcoal, and a tooth-brush.

Objectives

To identify different types of leaves and take their impressions.

Activity

Take the students on an outing and let them observe different types of leaves.

The teacher asks the students to collect different fallen leaves and take their prints/autographs in the following way:

1. Place the leaf on a notebook with its lower surface, on which the veins are prominent, facing upwards.
2. Place a sheet of paper firmly on the leaf and rub over the leaf with a crayon. The impression or the 'autograph' of the leaf will appear on the paper.

Prepare such prints of different leaves.

The teacher can also ask the students to collect different fallen leaves and stitch these on to the paper.

The teacher can tell them of another way of getting leaf impressions as follows:

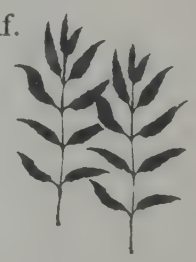
Place the collected leaves on the paper. Keep the water colour ready. Dip the tooth-brush in the colour and pass your thumb or a pencil over its bristles. This way the colour will be sprayed on the paper, and the leaf outline clearly seen.

Variation/extension

- Try matching the colours of the leaves with your crayons or water-colours.
- Name the plant or tree to which the leaf belonged.

Evaluation

- Students should be able to arrange one specimen of each leaf on the display board or sheets.
- Students should be able to identify the plant from the leaf.



AQUATIC PLANTS

45

Objectives

To observe and compare various aquatic plants.

Activity

Bring an established aquarium with several plants into the class for the students to observe.

Ask the students to point out (and help them name) the plants,

- which float on the water surface
- which come above water as they grow
- which have roots in the soil in the aquarium
- which lack roots

Ask the students to observe the differences in the shapes of leaves of these plants depending on the level in the water at which they grow — submerged plants; plants with floating leaves; plants which are amphibians (i.e. living both below and above the water surface) such as arrowhead.

In amphibious plants ask the students to observe the different kinds of leaves on the same plant.

Variation/extension

The students can compare the stems of land and aquatic plants. The students may be shown the roots of a land plant.

Further reading

- Aquatic Angiosperms by
Dr. K. Subramanyam, CSIR, New Delhi

Evaluation

Ask the students questions on the observations made.

How can some aquatic plants do without roots?

Why are the stems of aquatic plants soft and spongy?

Why are stems of land plants hard and stiff?

Thrust areas
Environment, Habitat

Subject
Science

Place
Classroom

Group size
Entire class

Duration
30 minutes

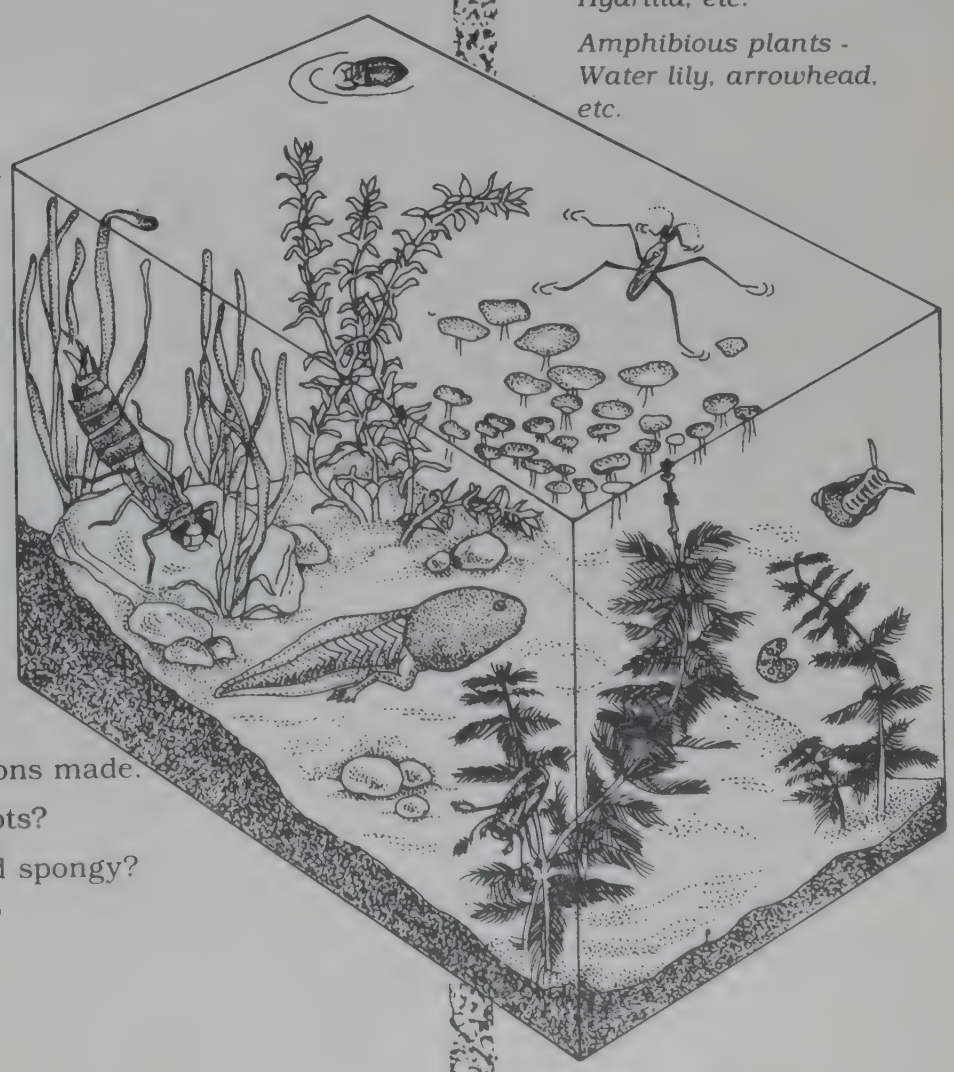
Suitable time/ season
All year round

Materials
An established aquarium with the following plants:

Surface plants - singada, water hyacinth, lotus, etc.

Submerged plants - Hydrilla, etc.

Amphibious plants - Water lily, arrowhead, etc.



46 SEASONS OF TREES

Thrust area
Environment

Subjects
Science, Craft

Places
Classroom, Outdoors, Home

Group size

Duration
1 year

Suitable time/ season
Every two months

Materials
Drawing papers
Colour pencils

Prerequisites
Drawing skills

Objectives

Familiarising students with the seasonal changes in trees.

Activity

Ask the students to draw rough sketches of trees growing either in the school garden or in their home backyards or any other familiar place. They should each select a few different types of trees to add variety to the project.

The sketches and pictures of the trees should be prepared and put up on the display board. If possible, printed pictures of particular trees should accompany the sketches.

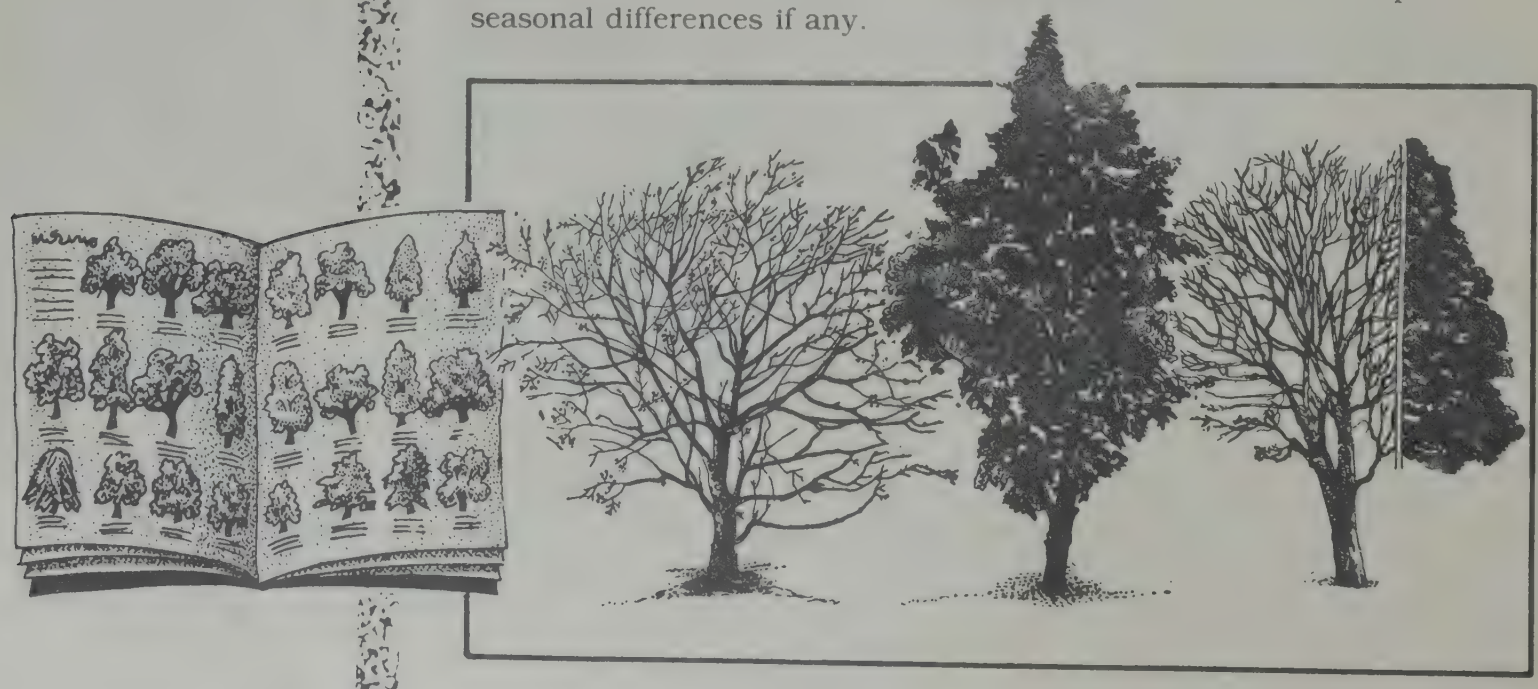
The trees should be visited and sketched at intervals of two months. The sketches made on subsequent visits should be displayed alongside the first ones for comparison. The seasonal differences will be graphically and should be explained in a small note under each sketch.

It will be noticed that some of the trees may have leaves throughout the year i.e. they are "evergreen" while others change leaf colour and drop their leaves and they are "deciduous"

The flowering period and subsequent fruiting time should be noted. Discussions on possible influence of seasons on periods of leaflessness and flowering should be held.

Variation/extension

Students should observe life on and around their trees and explain seasonal differences if any.



GROW UP WITH YOUR TREE

47

Objectives

To let students see for themselves that a little seed, when properly nurtured, will grow into a magnificent tree.

Activity

Ask the students to bring lemon seeds.

Let them soak the seeds in water for 8-10 hours (overnight).

They now fill a pot with soil from the garden and add manure. Ask them to plant the seeds about 1.5 cm. deep into the soil and keep the soil moist. The pot should be kept in a semi-shaded place.

Ask them to water the pot at least once or twice a week. (They must not water it every day or the seeds will rot).

If they have watered the pot regularly, the seedlings will sprout in about 8 weeks.

When the plant is somewhat large, they can carefully take it out of the pot without damaging the roots, and replant it in a protected place outside, or they can build a fence or a protection around it to prevent a passing animal from trampling upon or eating it.

Look after the tree as you go through school.

Variation/extension

Collect seeds of other common fruits and plant them.

Thrust area
Agriculture

Subjects
Science, Craft

Places
Outdoors, Home

Group size
Entire class

Duration
About 8 weeks

Suitable time/ season
During monsoon

Materials
Lemon seeds, flower pot, soil, manure

Germinating seed

48 THE HEIGHT OF IT

Thrust area
Environment

Subjects
Science, Maths

Places
Classroom, Outdoors, Home

Group size
2 students

Duration
15-20 minutes

Materials
A ruler or a measuring tape, a pencil or a stick

Objectives

To estimate the height of a tree.

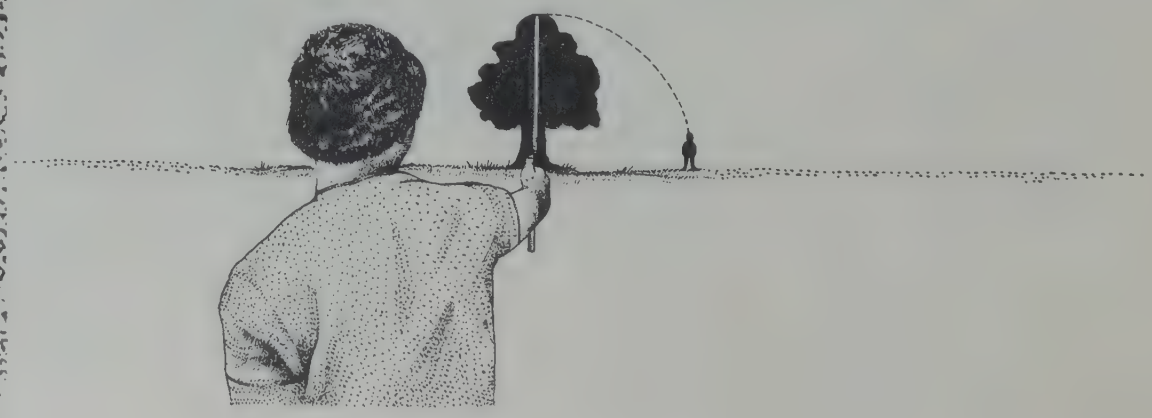
Activity

There are various ways of measuring the height of a tree. One of these is suggested here. Give the students the following instructions:

- Select a tree whose height you would like to measure.
- Walk away from the tree being measured so that the full height of the tree is visible.
- Take a pencil, stick or scale in your hand and hold it upright with your arm fully outstretched.
- Now hold the stick so that the upper end is in line with the top of the tree.
- Slide your thumb downwards on the stick until it lines up with where the tree meets the ground.
- Keeping your thumb firmly in place, turn the stick through a right angle i.e. from a vertical to a horizontal position.
- Keep your thumb in line with the base of the tree and with the upper end of the stick note the distance it appears to cover on the ground.
- Ask a friend to walk from where you are standing to the base of the tree, dragging a foot if possible to mark a line on the ground. Now ask him to walk at right angles to this line. When he appears lined up with the end of your stick ask him to stop, and to make a mark on the ground at the point. Measure the distance from the mark to the base of the tree to get the approximate height of the tree.

Variation/extension

Measure in the same way the height of a person or a building and where possible compare your result with the actual height.



SUN, EARTH & MOON

49

Objectives

To make students understand the concept of day and night and the phases of the moon.

Activity

Darken the room before starting the activity. A powerful torch or directional table lamp should be placed on a desk to represent the sun.

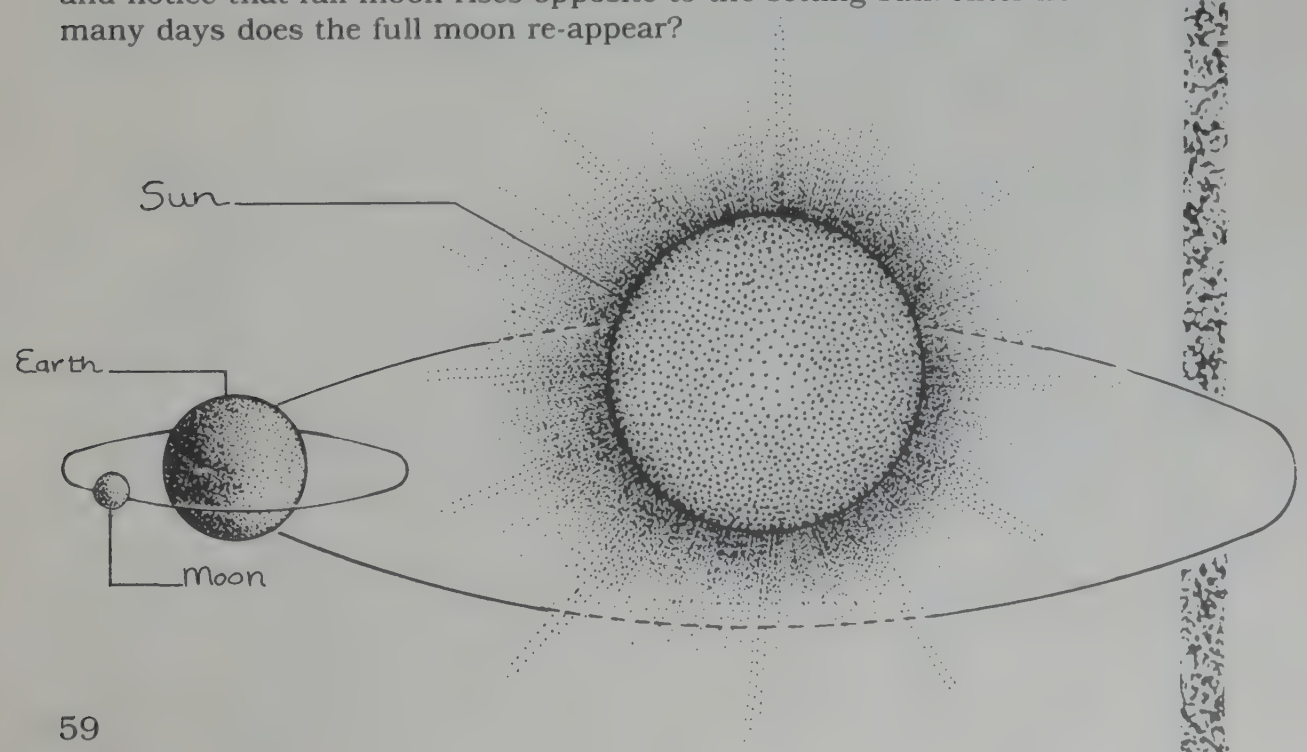
The students (approximately 15 at a time) should form a closely packed circle in the centre of the room, facing outwards. Ask them to move anti-clockwise. Explain to them that they represent the rotating earth and the lamp represents the sun. Make them understand day and night, mid-day, mid-night and sunrise, sunset.

Now ask one of the students to hold the ball over his head so that the entire class can clearly see it. He should stand at the end of the room and should move in a circle between the "earth" and "sun". The students on "earth" will notice that the shape of the lighted part of the ball gradually grows till the student (moon) reaches the part of the room exactly opposite to the light. At this point, the side of the ball facing the "earth" is entirely lit. This is the "full moon".

As the "moon" continues moving anticlockwise around the "earth", the shape of the lit portion as seen from the "earth" decreases.

Variation/extension

Students should be asked to observe the actual phases of the moon and notice that full moon rises opposite to the setting sun. After how many days does the full moon re-appear?



Thrust area
Environment

Subject
Science

Place
Classroom

Group size
Entire class

Duration
30-40 minutes

Materials
Large bright light, volley ball

Pre-requisites
The students are acquainted with the fact that the moon's light is reflected sunlight and not its own.

50 LAMPS

Thrust area
Energy

Subject
Science

Place
Home

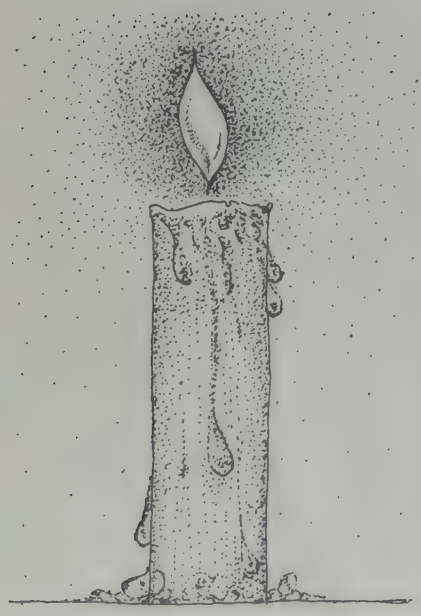
Group size
2 to 3 or individual

Duration
1 hour

Suitable time
Night

Materials
Oil lamp, small kerosene lamp or lantern, candle, matchbox, oil, kerosene, ruler, string, paper, pencil

Pre-requisites
Ability to measure distances with a ruler



Objectives

To enable the students to compare the intensity of light from different sources.

Activity

Ask the student to light an earthen oil lamp and place it at one end of a room at home at night.

Ask him to tie a long string and place one end below the lamp and the other at the opposite end.

On a piece of paper, let him write his name. He should now try to read his name in the lamp-light at varying distances from the lamp.

At the far end of the room he will not be able to make out the letters. Ask him to walk towards the lamp slowly and mark the distance from the lamp at which he can read the name. Measure the distance from the lamp.

Ask him to repeat the activity by replacing the oil lamp first with a candle and then with a kerosene lantern.

Then compare the distances and infer the strength of the light from the lamp.

Let the students discuss sources of bright light. How far is the head-light of a car or tractor visible? Let students imagine how bright the sun is.

Variation/extension

Where electricity is available, a table lamp can be used with bulbs of different watt capacity, e.g. 15, 30, 50, 60 and 100 watts.

Evaluation

Why do people use oil and kerosene lamps for lighting in villages?

Why do different students find different distances at which writing cannot be read with lamp and lantern?

Involve students in a discussion about lighting in the home, streets and industries.

WEATHER REPORT

51

Objectives

To make students conscious about the changes in weather. To develop skills for observing weather changes. To introduce them to graphic skills.

Activity

Let the students discuss the weather. How many types of weather conditions can they describe? Ask the students to prepare symbolic drawings of different weather conditions like the ones shown below.

The students can develop symbols according to the climate in their area.

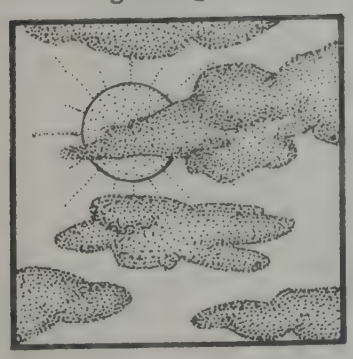
Students should make a chart with a square of 4 cm × 4 cm, for each day of the month. They should be asked to fill each of these squares with a symbolic drawing appropriate to the weather prevailing on that day. For example, if the season is monsoon and it is very cloudy on Monday the 1st, the students will stick the "Very Cloudy" symbol on the square. On Tuesday the 2nd, if it is rainy, the students will paste the "Rainy Day" symbol on the square and so on.

Ask the students to make weather predictions each morning as they come to school and to record them. Were they right? If so how many times each month? They could record right or wrong predictions by putting a "✓" or "×" in one corner of the day's square along with the correct symbol.

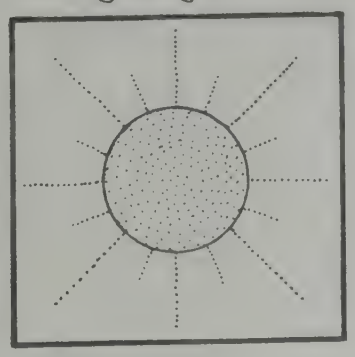
Variation/extension

Ask the students to compare their observations with the weather forecasts in the newspaper or on radio or television.

Cloudy day

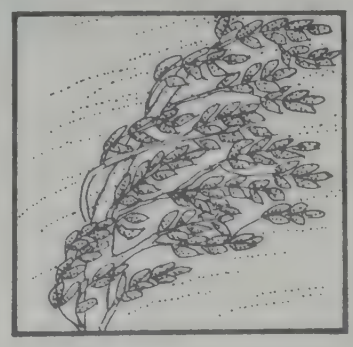


Sunny day



Rainy day

Windy day



Thrust area
Environment

Subjects
Science, Craft

Place
Classroom

Group size
Entire class

Duration
Year-round

Materials
Card paper, calendar, colour pencils, crayons or paints

52 STARRY STARRY NIGHT

Thrust area
Environment

Subject
Science

Place
Outdoor

Group size
15 to 20 or individual

Duration
1 hour

Suitable time
At night, when the sky is clear

Material
Reference illustration for prominent constellations, candle or torch, dark coloured card paper and pins

Pre-requisites
Teacher should have introduced the students to basic astronomy

Objectives

To become familiar with some major stars and constellations.

Activity

Before the students are actually taken out to observe the stars, the following is done in the class.

Ask each student to get 10 dark coloured cards of size 10 cm × 15 cm. Help them prick small holes in the pattern of prominent constellations, one constellation on each card. For the brighter stars, they can make larger holes. Write the name of the constellation on the front of each card. The following could be the constellations chosen as at least some of these will be visible in the night sky at any time of the year: (1) Great Bear/Big Dipper (Saptarishi); (2) Little Bear/Little Dipper (Laghu Saptarishi) with Pole Star (Dhruva); (3) Cassiopeia (Sharmishtha); (4) Orion (Mriga) with Betelgeuse (Aardra) and Rigel (Banraj); (5) Sirius (Vyadha); (6) Pleiades (Krittika); (7) Taurus (Vrishabha) with Aldebaran (Rohini); (8) Scorpio (Vrishchika) with Antares (Parijat); and (9) Leo (Simha) with Regulus (Magha).

When the students go out for star-gazing, the teacher tells them to look at their cards against the candle and try to identify the constellation in the sky. Encourage students to help each other.

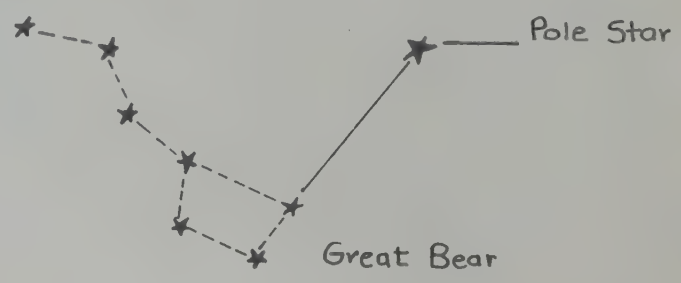
In this way, after a week's observation, the students would have got familiar with about 5-6 constellations and the position they are seen in each night. Show them the Pole Star.

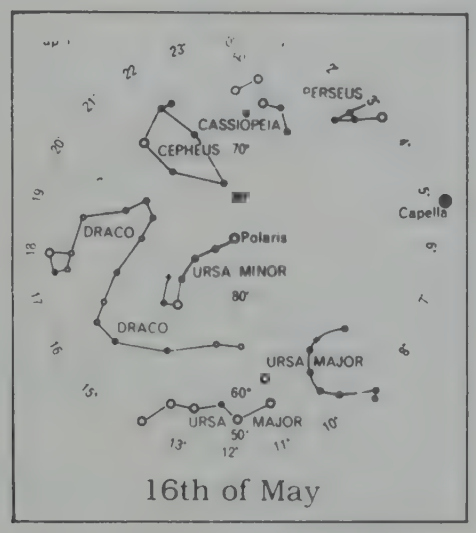
Variation/extension

Let the students form two groups. One group stands in a way to form the pattern of a constellation and the other team should guess which constellation it is.

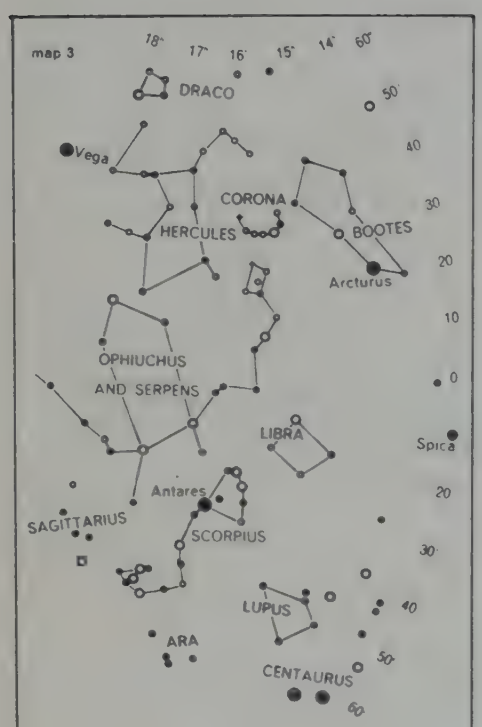
Evaluation

The student should be able to sight and recognize at least a few major constellations.

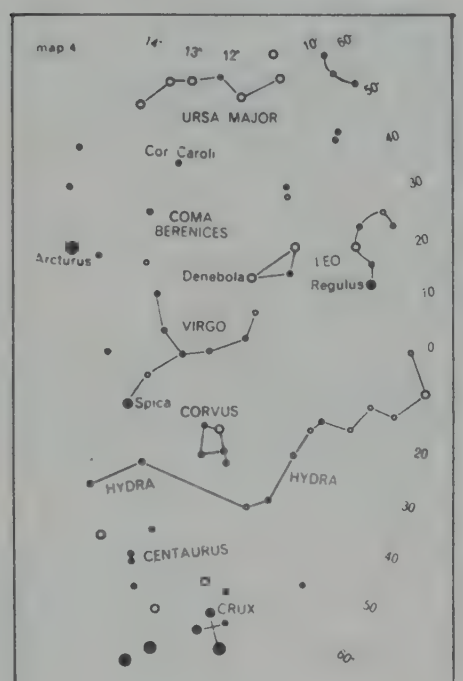




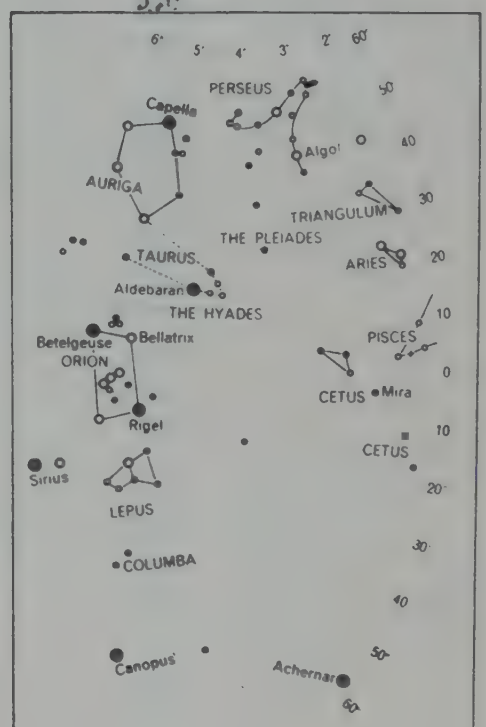
16th of May



1st of July



16th of May



1st of January

These are four separate charts showing the positions of the stars and constellations mentioned in the activity, at 9 p.m. on or around the date mentioned below each chart. The exact timings would vary across the breadth of the country.

The chart at top is centred on the pole star. The three below are centred along the equator. Some of the southern stars cannot be seen from the northern part of India. Similarly some of the northern stars will be seen lower down in the sky from peninsular India.

53 HEAVY WEIGHTS

Thrust area
Wildlife

Subject
Maths

Place
Classroom

Group size
Entire class

Duration
30-40 minutes

Materials
None

Pre-requisites
The children know their own weight (in kg.)

Objectives

To conceptualise large weights in terms of units which primary school students understand.

Activity

Get all the students to tell their weight. If some students don't know their weight, ask them to say whose weight is approximately the same as theirs and use that.

Ask students to guess the weights of very large animals — an elephant, a rhinoceros, a tiger, etc., then tell them the correct weight.

The students should bunch up together till they add up to the weight of the various animals. The group can be asked to make the sound of that animal or run together like it before sitting down and going on to the next animal.

Variation/extension

A cut-out of the different animals used for the activity can be made and stuck on to a stick which the first child in the group can hold up.

Ask the students to make a list of all the animals they can think of which are heavier than themselves.

Weight chart :

Chital
86 kg

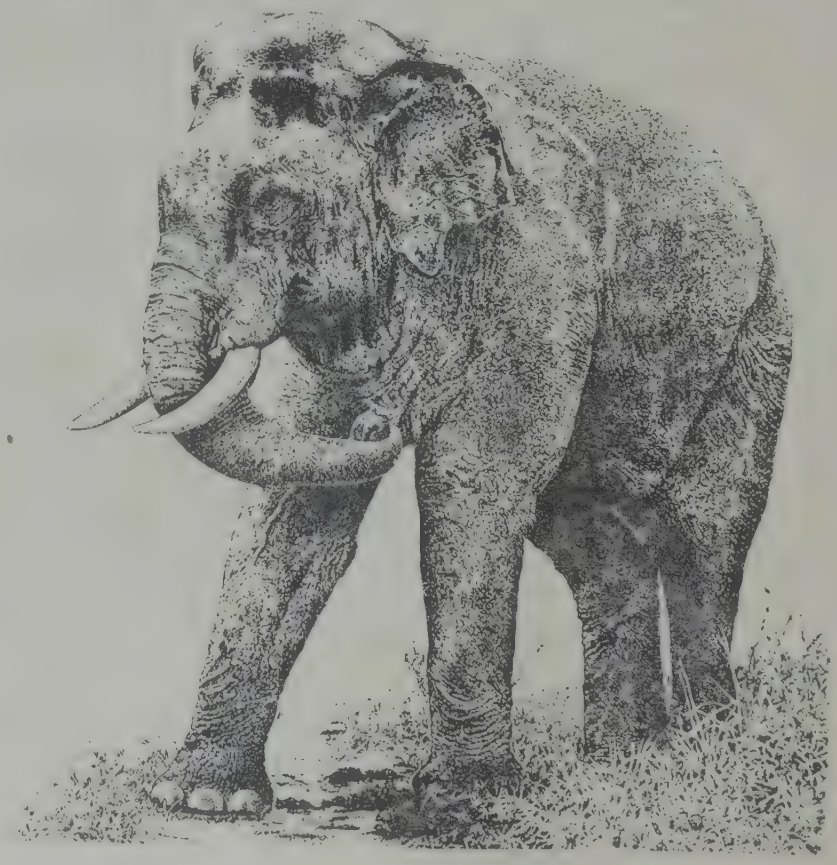
Camel
726 kg

Tiger
100-227 kg

Rhinoceros
1000-2200 kg

Elephant
5000 kg

Blue Whale
181.000 kg



FLOATING IN THE AIR

54

Objectives

To see how light objects float in the air.

Activity

The student collects the required material from around her. She selects a location about 3-4 metres above the ground, e.g. the balcony or roof of a house. From this height she drops the materials — paper, balloon, feather, pebbles, stone, cotton wad, leaf, etc. — one by one.

The student observes the flight of these objects, and notes which of these take a straight path, and which float in the air and reach the ground in a zig-zag manner.

Then ask the student to take two identical pieces of paper and crumple one into a ball. Now let her drop both from the same height and see which one falls faster. What is the relationship of shape to the ability to float in the air?

Variation/extension

- You could explain to the student how certain seeds which are light have developed structures so that they are dispersed by the wind to germinate elsewhere.
- How does air pollution spread?

Evaluation

Ask the students to take a piece of paper and make a shape that will drop the slowest.

Thrust areas
Ecology, Forestry, Pollution

Subject
Science

Place
Outdoors

Group size
Individual

Duration
20 minutes

Suitable time/ season
Any time

Materials
Paper, balloon, feather, pebbles, stones, cotton wad, leaves, ball, etc.

55 SOUND AND NOISE

Thrust areas
Environment, Pollution

Subjects
Science, Social Studies

Place
Classroom

Group size
Entire class

Duration
30 minutes

Materials
Note book, pencil, objects for making sounds with

Objectives

To make students aware of the concepts of sound and noise and realise that these are relative terms.

Activity

Ask students to make a list of sounds they hear. These may be sounds from nature like falling water, a wind blowing or thunder; they may be sounds made by animals like a dog barking, a bird chirping or a donkey braying; or sounds of man like singing, shouting, scolding etc. Ask them to sort out these in terms of pleasant sounds and unpleasant sounds. Are the sounds classified perceived the same way by all the students?

Ask each student to make some sound. You can tell them to make animal sounds, or any other sounds — even an unusual one which is not generally heard. They may also make sounds using another object, like rubbing two things or banging one against another. Let the other students say whether they felt the sound was pleasant or unpleasant.

Ask students to indicate what functions sounds made by animals perform. Do they think these sounds are pleasant or unpleasant to the animals?

Variation/extension

What are different animal sounds called?

Can you make a sound that a cat would not like, or a dog would like?

SOUND AND SEEK

56

Objectives

To sensitise students to sound and its usefulness in survival.

Activity

Mark a field of suitable size, say 15 or 20 metres square. It may have one or two obstacles like trees, rocks, etc.

Make the students sit in a circle and explain the game which is to be played within the marked field. Two students will get the same type of sound-maker. They have to locate each other by sound only. Each pair will have different sound-makers.

Blindfold all the students. Let them stand, spread out in a group. Then give the same type of sound-makers to two different students standing as far away from one another as possible. One student is not given any sound-maker. Each pair thus formed, therefore, gets a different type of sound-maker.

Each student starts about, occasionally halting and making the sound, in order to find the other student who is making a similar sound.

Each sound represents an animal. The student without any sound-maker plays a predator, claps his hands while moving about and tries to catch his prey by the sound. Obviously, he cannot catch those who have found their partners and therefore have stopped making sounds.

Variation/extension

- Those killed should go out of the game, including the partner.
- Those killed may rejoin the next rounds.
- Increase the number of predators.
- Try with the predator moving without making any sounds.

Thrust areas
Ecology, Conservation, Wildlife

Subject
Science

Place
Outdoor

Group size
15

Duration
30 minutes

Suitable time
Night

Materials
Different objects which make sound, like spoon and plate, two newspapers, two sticks, rattle, bottles, whistles, etc. They should be in pairs so that two students can make the same kind of sound. Also blindfolds for all.

57 SMELL AND SOUND

Thrust areas
Ecology, Wildlife

Subject
Science

Place
Outdoors — fairly flat area of 6 m × 9 m with some trees

Group size
Group of 5

Duration
60 minutes

Suitable time
Any time — can be played at night too

Materials
5 blindfolds : handkerchief may be used

Rope, approximately 30 m. long, to cordon off an area.

Dry leaves

Watch

An aromatic substance : a crushed onion or a crushed clove of garlic placed in a container. Attar on a piece of cloth.

Prerequisite
The students should know that most mammals give off a distinct smell from their bodies.

Objectives

Children learn to use the senses of smell, hearing and touch, especially the sense of smell.

Learn how predators and prey interact.

Activity

Cordon the area off with rope. Spread dry leaves at different locations within the area.

Make one student the predator (tiger) and the rest of the group the prey (deer). Blindfold them all including the 'tiger'. The tiger has to carry the aromatic substance.

The deer have to move all the time.

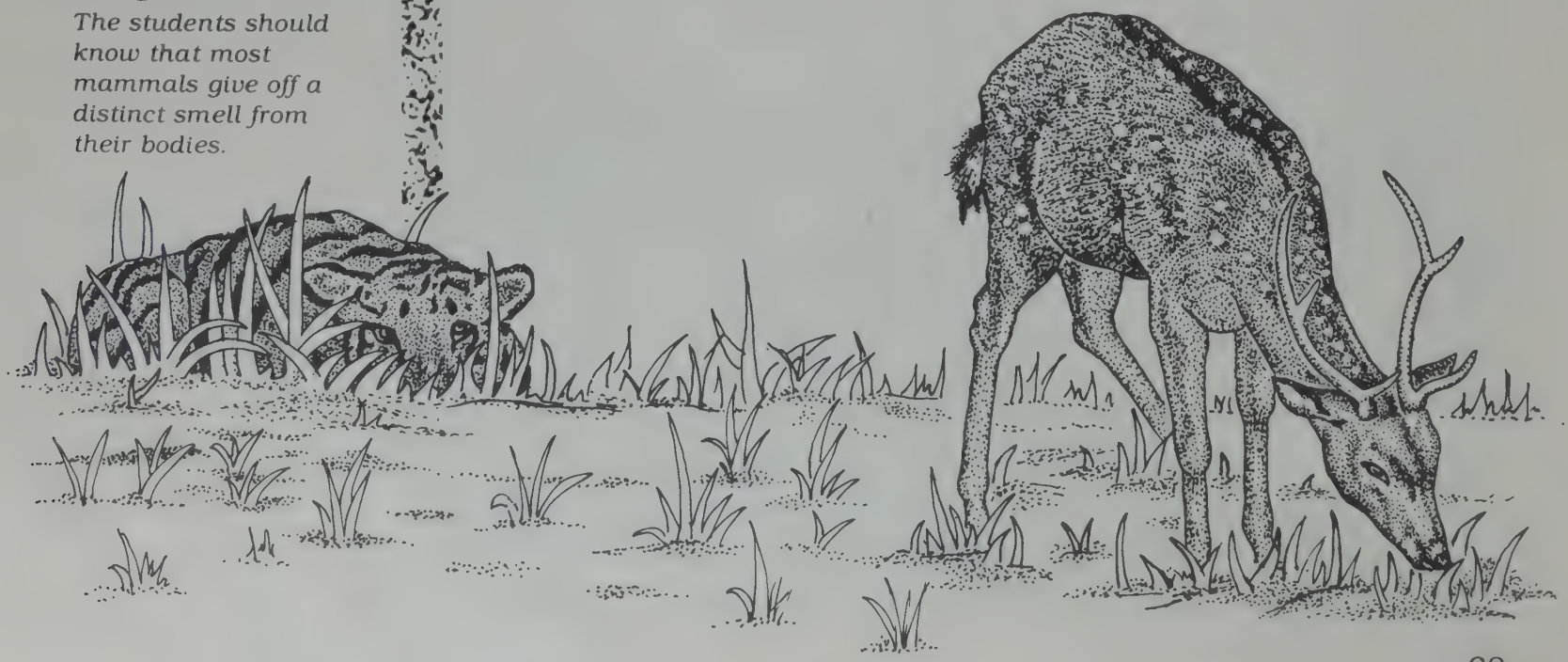
The tiger, who has to catch a deer to win, does not have to move around all the time.

The tiger should be positioned at one end of the area and the deer scattered around the field. Start the game.

When a deer is caught, the game can be played again with another student becoming the 'tiger'. If the tiger does not make a catch within two minutes, it 'dies' (of hunger!) and retires from the game.

The deer should concentrate on whether they can smell the aromatic substance or not, as that is the only way that they can tell that the tiger is approaching. Both the tiger and the deer should listen for sounds.

Discuss with the students what other senses the deer uses to protect itself, and the tiger to hunt, in the wild.



SWOOP-IN

58

Thrust area
Wildlife

Subject
P.T.

Place
Outdoors

Group size
Entire class

Duration
30-45 minutes

Materials
Stones, balls

Objectives

To appreciate how difficult it is to catch things while moving.

Activity

It is easy to pick up things or catch objects when one is stationary but much more difficult if one is moving fast and even more difficult if the object is also moving.

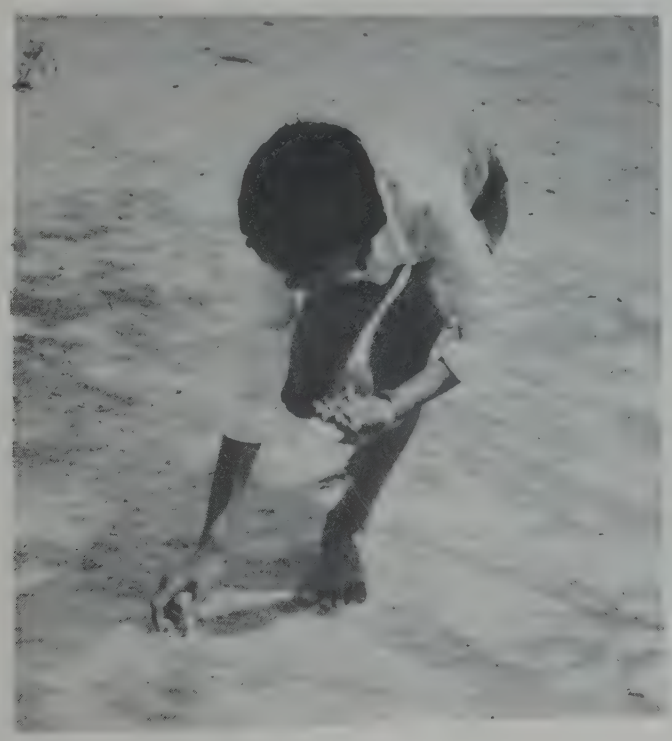
Yet this is the standard way in which many birds catch their prey. Kites and birds of prey swoop down on small animals or birds. Bee-eaters and drongos manoeuvre their flight to catch moving insects in the air.

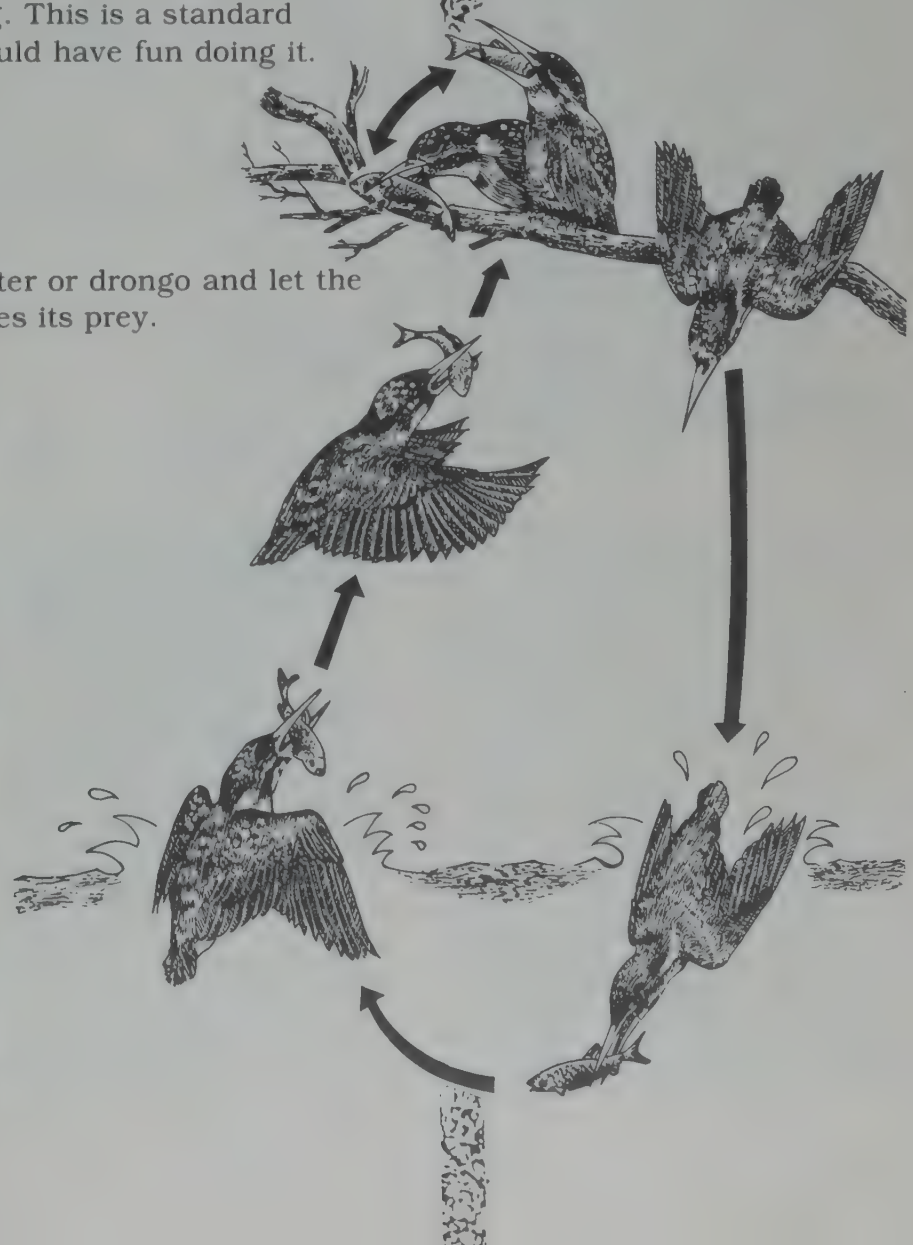
For the activity, ask students to pick up a small pebble. They can do this easily. Now get them to come running from a distance, as fast as they can, pick up the same pebble without stopping, and run on. It is not so easy.

One can take a ball and roll it on the ground or throw it up in the air and the student should catch it while running. This is a standard practice exercise for cricket, and children should have fun doing it.

Variation/extension

Now try and locate some birds like the bee-eater or drongo and let the students observe how skillfully the bird catches its prey.





59 ENERGY FOR WORK

Thrust areas
Energy, Ecology

Subject
Science

Places
Classroom, Outdoors

Group size
Entire class

Duration
30 minutes

Materials
None

Objectives

To understand the link between food and energy in man and animals.

Activity

Discuss with the students the concept of work. Tell them that objects at rest remain at rest and tend to remain so unless force (energy) is applied to move them.

Ask the students in the class to lift or push several objects, say books, pencils, stones, chairs etc. Make them understand that in all these lifting and pushing activities work was done and energy was provided from their muscles. Ask them where they got this energy from.

Ask the students to name animals that work for human beings. Using both human and animal examples show the link between food, energy and work.

Variation/extension

Ask students to bring pictures, photographs from newspapers, magazines etc. depicting work being done either by machines or people. Try to analyse the source of energy which is doing the work. You may organise an exhibition.

Evaluation

Ask the students to find out which are the most prominent sources of energy used today.

COLOUR FROM VEGETATION

60

Objectives

- To make students appreciate the use of natural materials.
- To make them interested in botany.
- To impart skills in making and using colours.

Activity

Before chemical colours had been invented, people got colours from plants, trees, animals and rocks.

Even today, there are traditional craftsmen in India who use vegetable dyes for printing on cloth.

Prepare colours from plant materials. Flowers of the Flame-of-the-Forest (Kesudo) will give a golden yellow colour. The plant materials are to be boiled separately in water and filtered. Turmeric (Haldi) can be used to get yellows too. Take fresh Haldi and crush it, put it in water and then filter it. Students can produce vegetable colours in their art class and use them to paint on paper and on cloth.

Once the concept of vegetable colour is introduced, the child can crush different things like flowers, leaves and barks and extract with water to produce colours. They should know that each of these will produce a different colour when dried.

Let the students draw outlines with black ink.

A matchstick with a small wad of cotton can be a good filling brush.

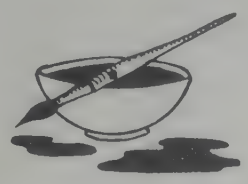
Variation/extension

Colours can be obtained from the following also:

Colour	Plant source
Red	Sindhur tree (from fruits)
Brown	Tea (prepared), Kattha (Acacia katechu)
Violet	Purple grapes, Jamun fruits, Lantena, Falsa

Evaluation

What sort of vegetation can provide colours to man?



Thrust area
Environment

Subject
Craft

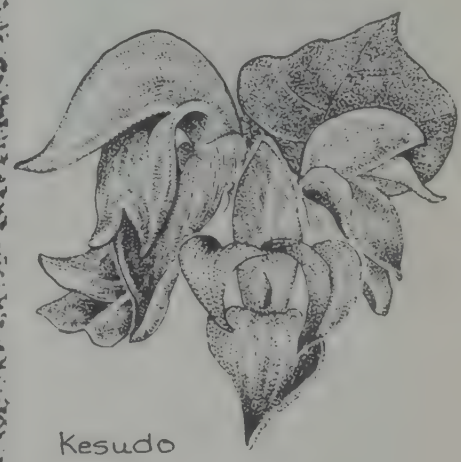
Places
Classroom, Outdoor, Home

Group size
5-6

Duration
1 hour

Suitable season
Spring (around Holi)

Materials
Paper, black ink or any ink, flowers, leaves, cotton



Kesudo

61 INSECTS

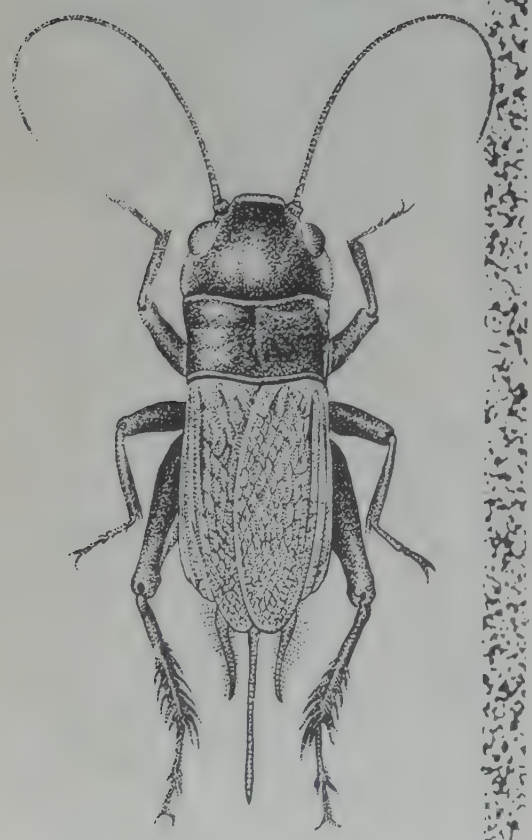
Thrust area
Ecology

Subject
Science

Place
Classroom, Outdoors

Group size
Entire class

Duration
30 minutes



Objectives

To get students to discuss insects and their likes and dislikes of them.

Activity

Start by discussing insects with students. The students may be taken out to a garden or a playground and asked to observe and identify some insects.

After this introduction, the teacher asks each student to think of an insect. He then asks each student to say why he likes or does not like the insect he has chosen.

As an example,

One student may say:
- "I do not like houseflies because they are dirty"

or

- "I do not like houseflies because they sit in dirty places"

Another student may say:
- "I like butterflies because they are pretty"

Or a third:
- "I like honeybees because they make sweet honey".

The teacher now talks about the usefulness of insects and the harm some of them may cause. Some insects help in pollination, like bees, butterflies, etc. Some like the praying mantis and the dragonfly feed on other insects and thus control the insect population. Many insects like butterflies are beautiful to look at.

Variation/extension

Let the students discuss with each other their reasons for liking or disliking an insect. Avoid giving value-based 'right' or 'wrong' answers to students.

Ask students to observe insects in their house.

THE ART IN HAND

62

Objectives

Familiarising the students with the various uses of the human hands in life, in arts and in understanding.

Activity

The hands, which may include the arms, are the most important and expressive limbs of the body. The teaching of the use of the hands should be through

- Movement
- Expression

The students can be asked to use only their hands in the activity.

Ask them to think of the various activities the hands can do — picking, flicking, clapping, etc. with one finger and then with all the fingers. Let each student act out one use and the others to guess what the activity is.

Then go on to expression with the hands — questions like what ? (open hands), numbers — one, two..... etc. how? No! etc. can be equally well expressed with hands.

Counting with the fingers is almost like having a calculator in your hand. Cupping of the hands for drinking water is like having a cup.

Go on to the wrist, its flexibility. The thumb. Ask students to write without using their thumb. Let them realize how each part is vital.

Tell the students about thumb and fingerprints. How criminals are often found out by their fingerprints. Make an exciting story. Use an ink pad and ask students to make thumb and fingerprints. Can they recognize their own?

Variation/Extension

- Continue into arm movements. History of the hands in Indian dance. What is a mudra? Teach them mudras for animals, birds, trees, etc. Mudras for worship are used in all civilizations.
- In which sports are hands essential and in which sports are they not so important?
- How do animals use their hands and limbs?

Certain mudras are good for health. Teachers can read and show the children how to perform these mudras. Make them enjoy creating new images. Shadow play of hands could also be of interest.

Thrust area
Environment

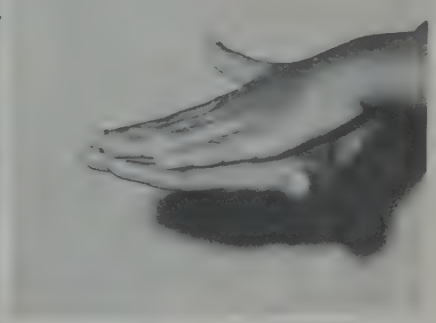
Subject
Performing arts

Place
Classroom

Group size
20-25 students

Duration
60 minutes

Materials
None



63 SYMMETRY

Thrust area
Environment

Subject
Craft

Places
Classroom, Home

Group size
Individual

Duration
10-15 minutes

Materials
Paper, ink or water colours, string

Objectives

To introduce symmetry in nature.

Activity

Ask the student to fold a sheet of paper into half, open it, sprinkle drops of ink or water colour on one half of it and then fold up the paper again.

Over the folded paper the student should make imaginary patterns by pressing the paper with his fingers. Alternatively let him place a string passing through the drops before folding the paper. Fold the paper, press it and pull out the string.

Now unfold the paper. The student will see interesting patterns on both sides of the fold.

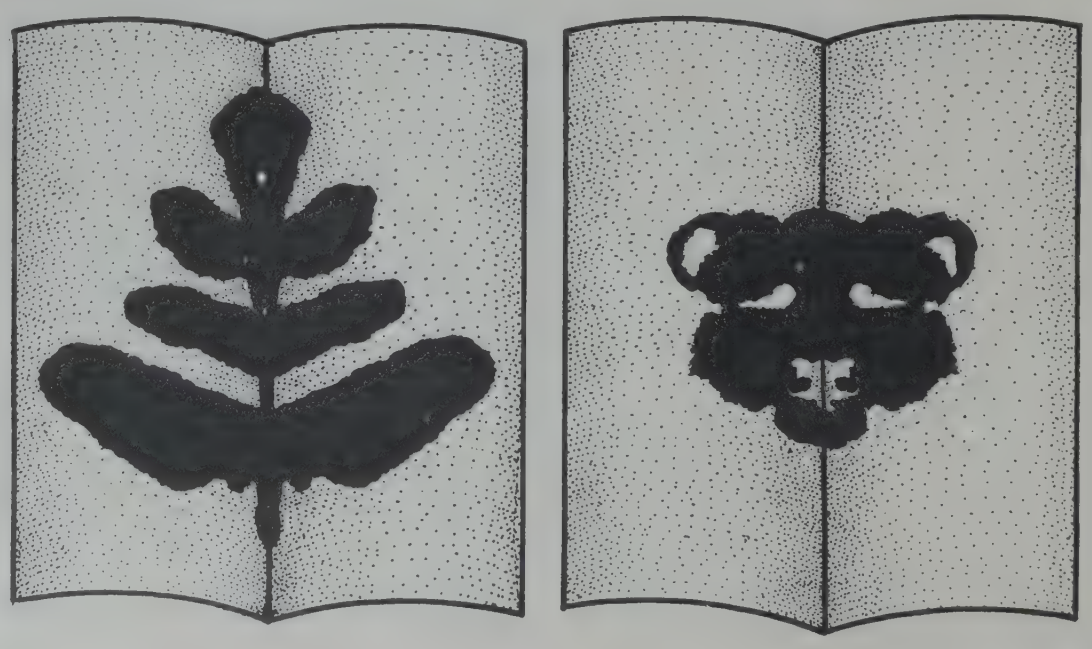
Ask the student to observe these patterns and let him imagine what shapes are seen in them. The student may draw connecting lines to give patterns a complete form, according to his imagination.

Ask the student what he notices in these forms. Does he notice that both halves are like mirror reflections of each other? Introduce the concept of symmetry.

Now let him draw in water colour quick illustrations of halves of symmetrical objects like a leaf, the front of a face, a glass, a tree, etc. and while the colour is wet fold the paper to complete the other half.

Variation/extension

Let the student observe symmetrical objects in nature and list them.



FOOTPRINTS

64

Objectives

- To understand how we use different parts of the foot for walking, running and hopping.

Activity

1. Let the students clear a piece of ground which is firm, and covered with fine dust. Divide it into three long strips (1 metre wide).
2. Water should be sprinkled and allowed to soak.
3. Let a student walk on one strip.
4. Let another run on the next strip.
5. Let a third student hop across the third strip.
6. Let them measure the distance between footprints on each of the three strips, and notice the different types of footprints made.

Based on this the teacher can initiate and develop a discussion on body movement and develop several other activities.

Thrust area
Environment

Subject
Science

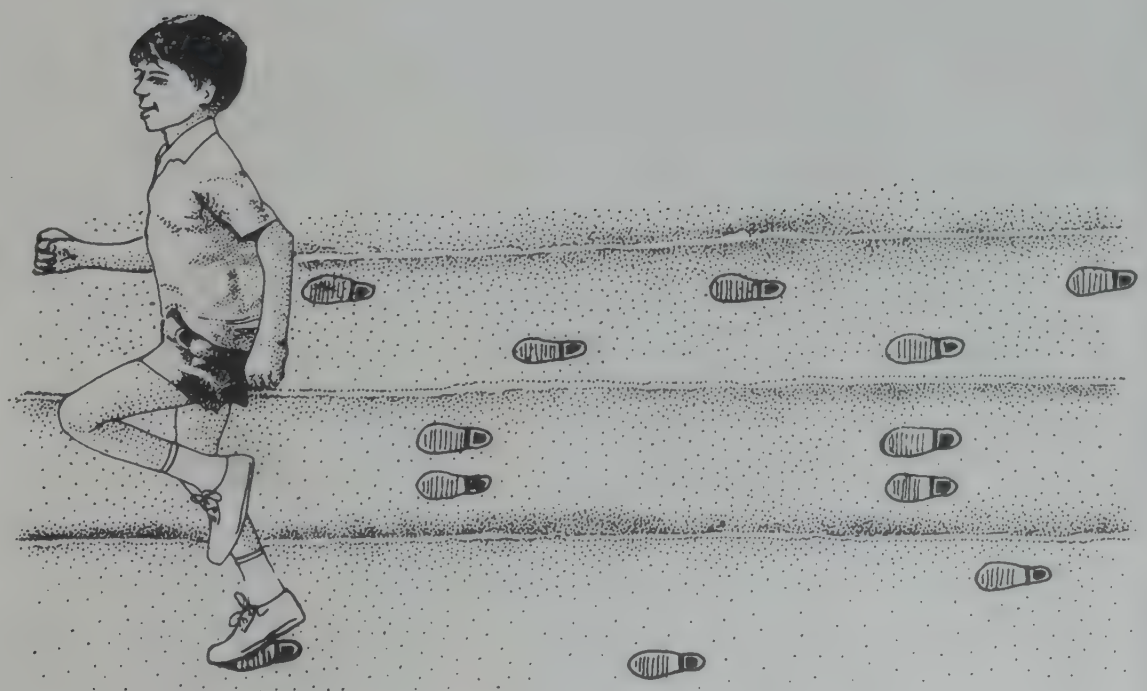
Place
Outdoors

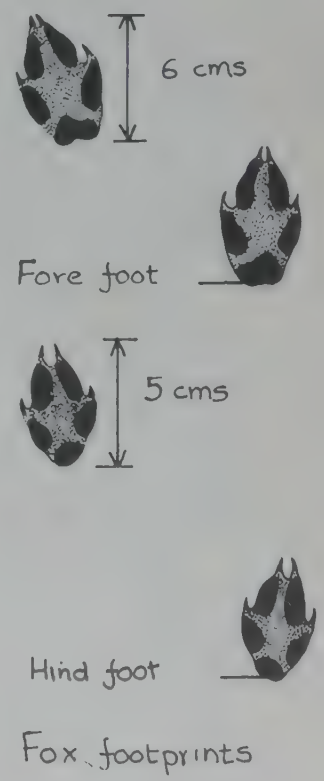
Group size
Entire class

Materials
None

Variation/extension

- Footprints of dogs, goats, ponies, birds should be examined and the parts corresponding to the human foot indicated.





Fox footprints

65 WATER AT HOME

Thrust areas
Energy, Conservation, Health, Pollution

Subjects
Science, Social Studies

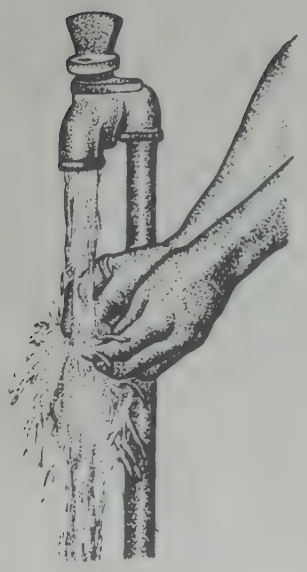
Places
Outdoor, Home

Group size
Entire class or individual

Duration
Several days

Suitable time/ season
Throughout the year.

Materials
None



Objectives

To know that

- Bringing water into the house involves expenditure of energy.
- Water is an important resource.
- Access to water depends on several factors.

Activity

Ask the student to observe the following:

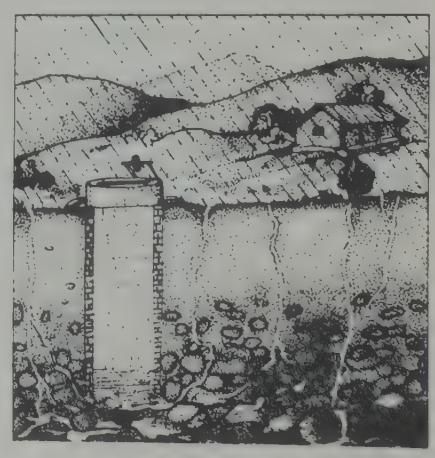
- How does water come into the home?
- Who brings the water home?
- For what household activities is water used?
- How far is the source of water?
- Do all households in the community get water in the same manner as yours?
- Who controls the source of water? Why?
- What is the minimum quantity of water required in your home every day?
- Where water is fetched from a well : Why do women have to bring water from the well? How much time do they spend to bring the water?
- Where does the water go after household use?
- In what season do you find cases of diarrhoea, jaundice?

Variation/extension

- How to purify water if there is an incidence of diarrhoea in your community?
- How to keep the water source clean?
- What activity should not be permitted near the water source?

Evaluation

The students' answers to the above questions can be used for evaluation.



ANIMALS IN OUR LIVES

66

Thrust area
Environment

Subject
Science

Places
Classroom, Outdoors, Home

Group size
Entire class divided into two groups

Materials
A large display board, painting material

Objectives

To make students aware of how animals contribute to our lives.

Activity

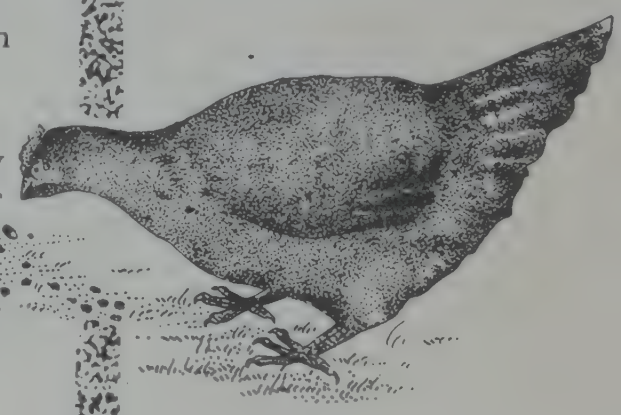
Ask students to make a list of the commodities and services which we get from animals. Divide the class into two groups. Ask one group to draw pictures of the animals which are directly used by man and the other group to illustrate the products and services they provide. This should be placed on the display board and pictures of the animals should be matched with their products and services.

For instance the picture of a buffalo or a cow should be matched with the picture of milk and its derivatives, or sheep with wool and woollen clothing.

Having done this, students should be asked to go out and observe various domestic animals and make notes on what they eat, how they have to be looked after, etc. Concepts of proper management and care of these animals should be discussed and excursions to farms and dairies should be organised.

Care should be taken not to omit animals which are used as beasts of burden.

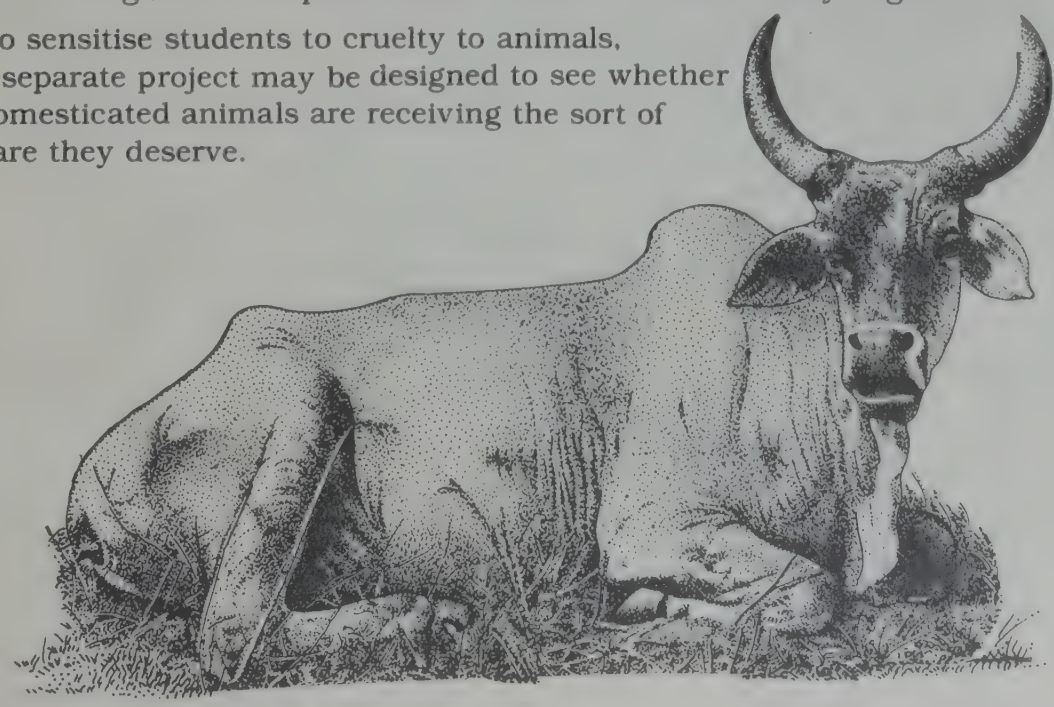
A separate list should be prepared of various animals kept as pets.



Variation/extension

Animals domesticated for traditional needs in other lands should be studied e.g., two-humped camels, reindeer, llamas, husky dogs, etc.

To sensitise students to cruelty to animals, a separate project may be designed to see whether domesticated animals are receiving the sort of care they deserve.



67 TENANTS IN OUR HOME

Thrust areas
Ecology, Population

Subjects
Science, Social Studies

Places
Classroom, Home

Group size
Entire class; individual when at home

Duration
Two sessions of 45 minutes

Materials
Card paper, crayons, scrapbooks

Objectives

To make the students aware of the fact that each one of us shares our home with others who affect us and who are affected by us.

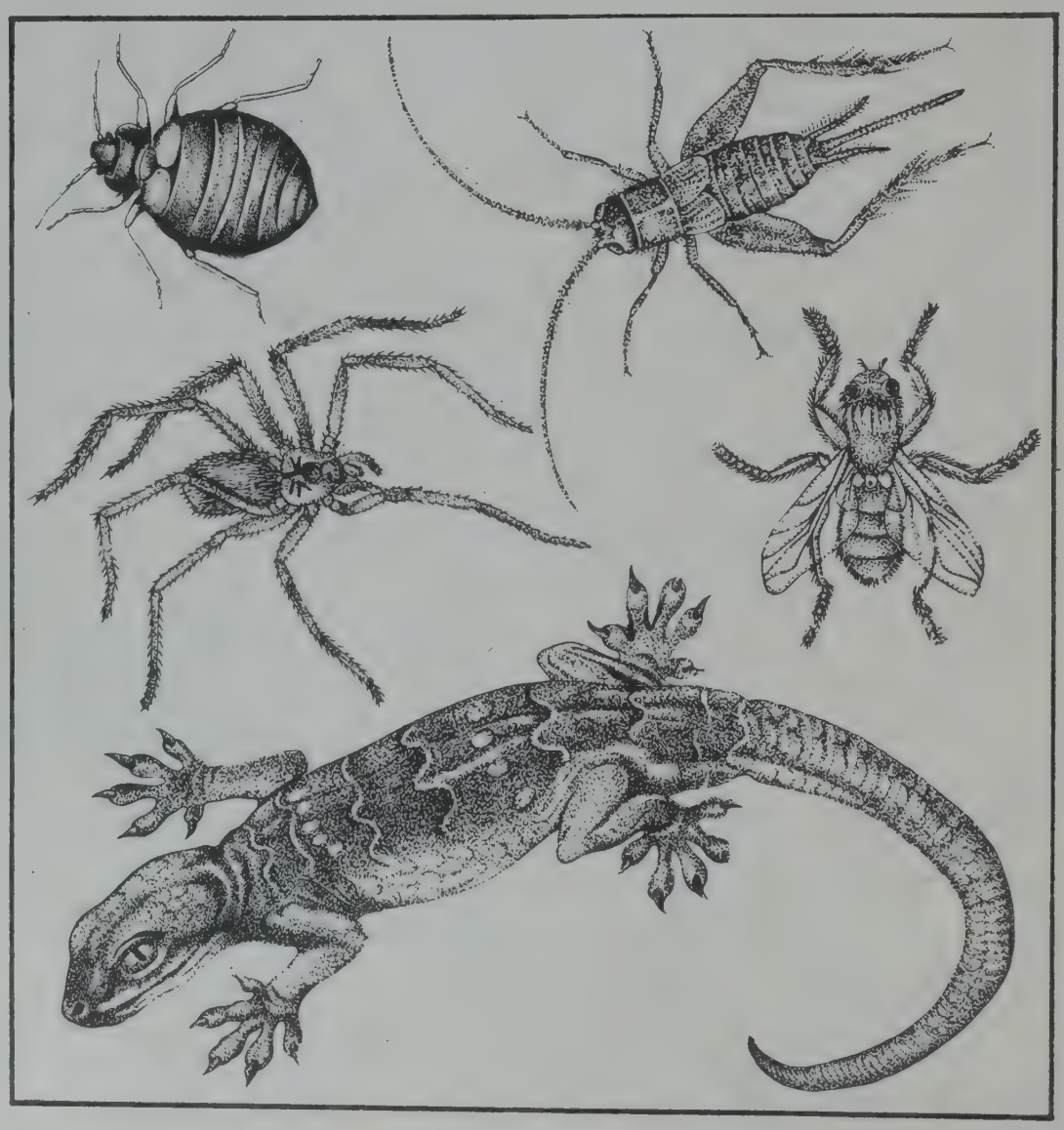
Activity

Each of the students should be asked to draw a sketch of his house and to prepare a list of everyone living in the house indicating their age and relationships.

The names, ages and relationship should be tabulated and additional columns be prepared, one for how the person is of use to the student and one for the way in which the student influences that person.

The student should then make a list of all types of animals living in the house and their contribution to his or her welfare or discomfort.

The students should be encouraged to make drawings of the various inhabitants of their homes.



THE THINGS WE EAT

68

Objectives

To enable students to identify the sources of different items of food.

Activity

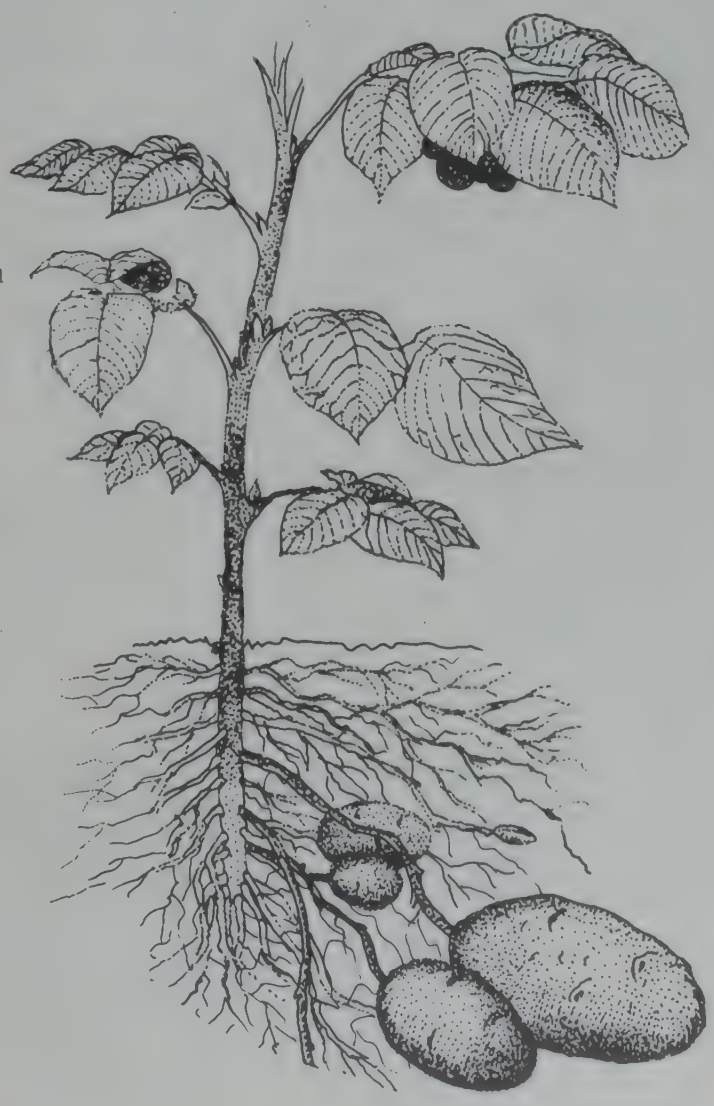
Ask the students who among them has eaten roots. The student answering should name the plant whose root he has eaten.

Similarly ask about other parts of plants like stem, bark, leaves, flowers, fruit, seeds, etc.

These answers could be listed on the blackboard. Students should then be asked to answer whether particular items are eaten raw or cooked — and if cooked, to name the dish.

They should further classify the plants into trees, shrubs, herbs, creepers, etc.

In the subsequent session each child should bring to class the various roots, leaves, seeds, etc. listed with a view to developing an exhibit board.



Variation/extension

Ask the students to identify plants of which more than one part is eaten.

Thrust area
Nutrition

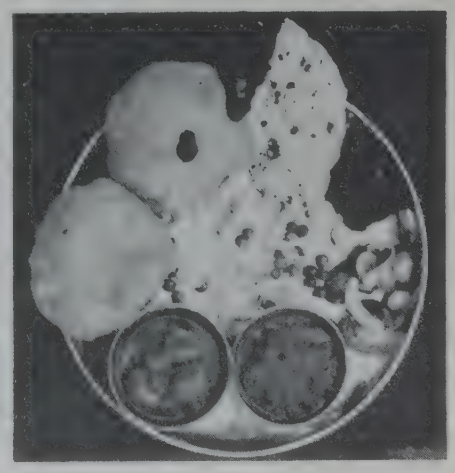
Subject
Science

Places
Classroom, Home

Group size
Entire class

Duration
Two sessions of 30 minutes each

Materials
None



69 ENERGY IN THE AIR

Thrust area
Energy

Subjects
Science, Craft

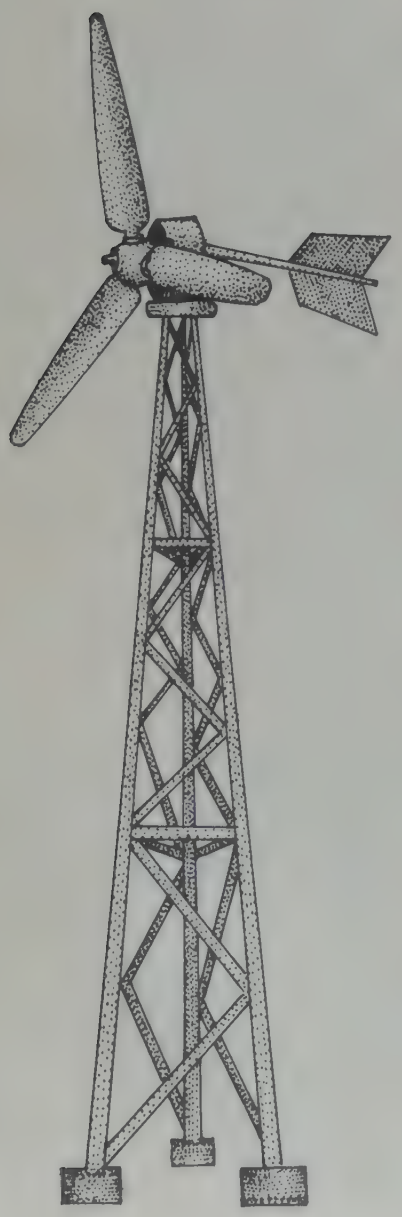
Places
Classroom, Home

Group size
Entire class or Individual

Duration
30-45 minutes

Materials
Paper, pin, eraser

Pre-requisites
Proper use of scissors



Objectives

To show how wind energy can be utilized to turn a wind wheel.

Activity

Have the students prepare a simple pin wheel (wind wheel) using paper and a straight pin. Fix it onto a soft material such as an eraser. Ask them to move it by different methods such as blowing on it, running with it or placing it in front of a fan.

They will observe that the faster the air moves, the faster the wind wheel rotates. Also, the wind wheel rotates faster when it faces the moving air directly. Let them deduce through a discussion that energy of the moving air makes the wind wheel rotate.

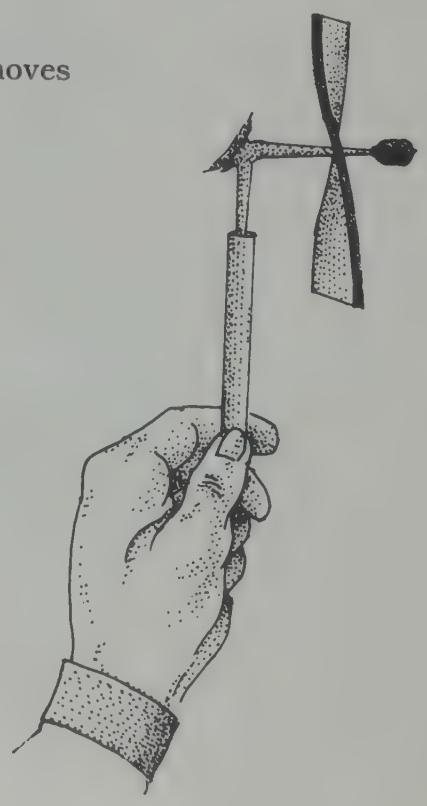
Variation/extension

They can also make wind wheels from aluminium foils used as the inner seals of various food cans.

Explain how the principle is utilised in windmills. How can you relate this to an electric fan?

Evaluation

Ask students to make a wind wheel and hold it so that it moves fastest. In which situation will it be most efficient?



MAKING A WHIRLWIND

70

Objectives

To demonstrate how a whirlwind is created by unequal heating of ground by sunlight.

Activity

Ask the students to place the smaller black sheet at the centre of the white one. These should then be placed in full sunlight.

After a few minutes, it will be noticed that the air over the black surface is shimmering — the teacher should suggest that the air is rising because it has been heated. The incense sticks should then be lighted and placed on all sides.

The movement of the smoke should be observed. The drawing in of the smoke towards the black surface should be noted and the reasons explained.

Students should also be asked to notice that the smoke spirals upwards over the black area from where the air is rising.

Students should also be made to see that the column of smoke becomes wider as it goes up.

Note: Care should be taken that there is no draft of air.

Variation/extension

Observe smoke from chimneys during the heat of the day.

Near the seashore, observe the winds blowing during the heat of the day and during the cool of the early morning. Explain the causes of land and sea breezes.

Observe clouds forming on a still, hot day and watch vultures and kites spiraling up under the clouds. Discuss why they glide in spirals.

Observe whirlwinds as many times as you get the opportunity. Note that they always turn in the same direction.

Thrust area
Energy

Subject
Science

Place
Classroom

Group size
Any

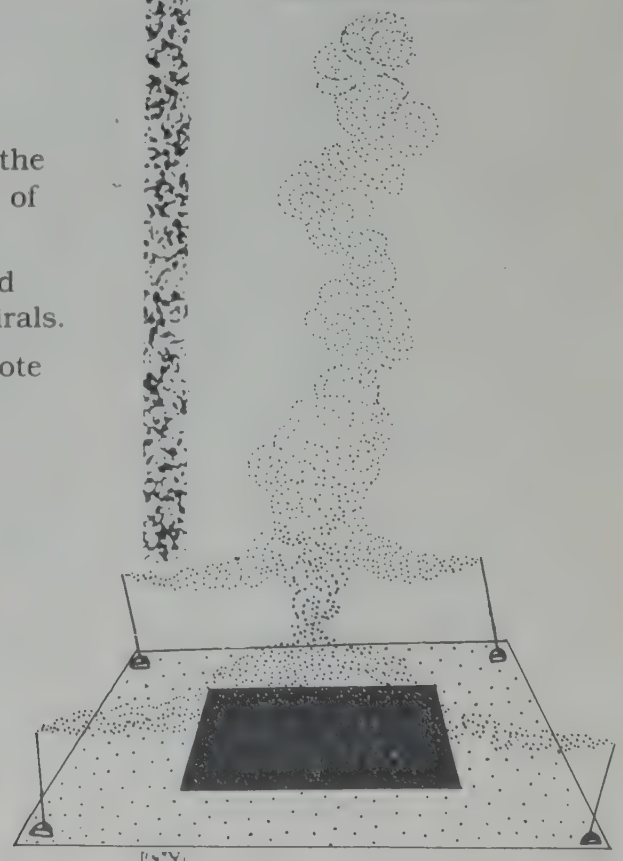
Duration
30 minutes

Suitable time
A hot, sunny day, preferably at mid-day

Materials
Two rectangular sheets of any easily available material — one white which should be about 1 m. square and the other, black, which should be about 0.30 m. square.

Sticks of incense (agarbatti)

Matchsticks and box



71 MISSING NUMBERS

Thrust area
Population

Subjects
Social Studies, Craft

Place
Classroom

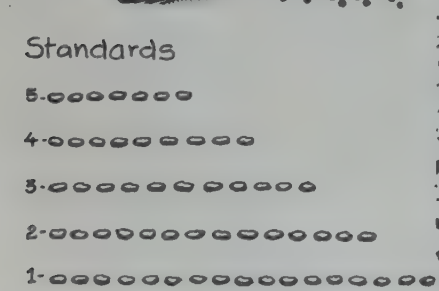
Group size
Group 5-10

Duration
30-45 minutes

Suitable time/ season
Any time

Materials
Tamarind seeds, or any seeds or other objects which are even-sized, flattish and not too small

Prerequisite
Ability to count, understanding of perpendicularity and proportionality



Objectives

Understanding population pyramids
Discussing the problem of drop-outs

Activity

This activity is suitable for schools in rural areas. It may not work in urban schools.

Help the students to obtain from the school register the number of boys and girls enrolled in each standard (all divisions combined).

1. Draw a straight line on the classroom floor, and another line perpendicular to it. Mark off on the perpendicular, at two centimetre intervals, the number of standards in the school. Number each standard, starting from the bottom of the perpendicular line (i.e. where it meets the horizontal line).

   Against each standard, starting at the perpendicular and proceeding left to right, ask the students to place in a horizontal line tamarind seeds or other readily available small objects of uniform shape. Use one seed for each student on the rolls. The seeds in each row should touch one another, and all the rows should be parallel.

   Let the students observe and comment on how the rows of seats are unequal length and how the lengths vary from the lower to the higher classes.

   Discuss the problem of school drop-outs in a sensitive way including social and economic reasons why certain students are unable to continue in school.

2. Now extend the horizontal line to the left and remove the number of seeds representing boys from the end of each row and line them up right to left, starting at the perpendicular.

   Ask the students to discuss and comment on the differences on the two sides of the perpendicular.

   Ask them how many students who were in their class last year are not there now.

   Where are they now? What are they doing? Why did they leave?

Variation/extension

- The students may stick the seeds with glue on a sheet of paper, instead of placing them on the floor.
- The teacher can show the students how to use these data to prepare a bar chart.

BUILD A PYRAMID

72

Objectives

To understand the concept of hierarchies.

Activity

Ask the students to do the following:

Take the empty matchboxes and build them into a pyramid. This can be done in many different ways (which the students may explore for themselves).

When the pyramid is built, ask the students to note -

- How many rows of boxes are there?
- How many boxes are there in each row?

Each row is a LEVEL, each box is a UNIT or COMPONENT of its level. The structure you have built has a single component at the highest level and increasing numbers of units as you go lower. Each unit has connections with the level above and below it (except of course the top and bottom levels). Any structure with such qualities is called a HIERARCHY.

Carefully remove a box from your structure, without disturbing the other boxes around it. The structure from that level up collapses. Rebuild the structure and remove another box. Repeat this a number of times. Observe what happens each time. Observe how the breadth of the base affects how much damage is done each time you remove a box.

Variation/extension

During your P.T. class, get together in a group of ten and form a human pyramid. What happens if one of you moves?

From these two experiments, can you say which is the most important component in a hierarchy and why?

On Janmashtami day organize a ''Dahihandi'' game at school as is done in some parts of the country. Can you see how hierarchies work?

Evaluation

Can you think of hierarchical structures other than a pyramid?

Can you think of examples of hierarchies in nature?

Thrust area
Environment

Subjects
Science, Craft

Places
Classroom, Outdoor, Home

Group size
Individual

Duration
30 minutes

Materials
4-5 dozen empty matchboxes

Pre-requisites
Counting ability, basic manual skills, a sense of spacing

73 CROWDING

Thrust areas
Population, Habitat

Subjects
Social Studies, Maths

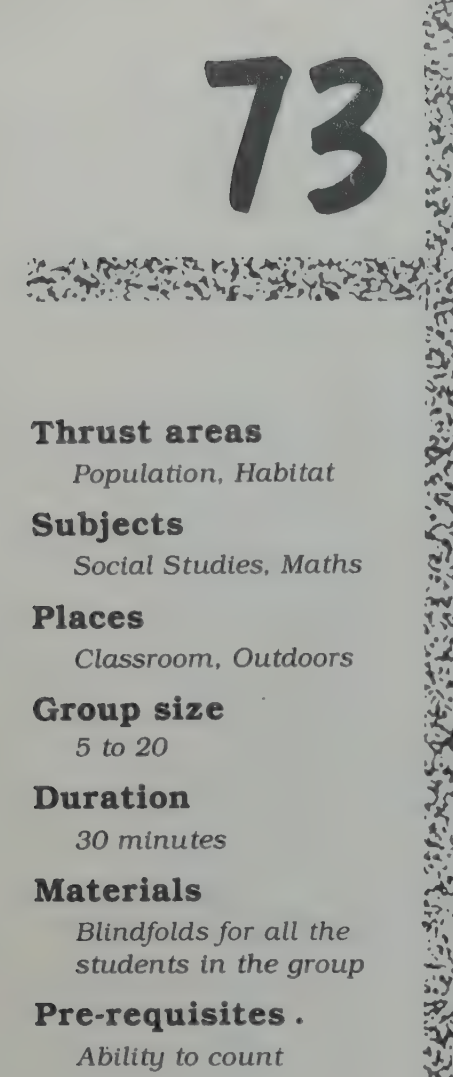
Places
Classroom, Outdoors

Group size
5 to 20

Duration
30 minutes

Materials
Blindfolds for all the students in the group

Pre-requisites .
Ability to count



Objectives

To understand how stress imposed by population size varies according to availability of resources.

Activity

Clear part of the classroom of all furniture. Blindfold five students and ask them to slowly walk around at the same time in the cleared area. Each student should keep count of the number of times he/she bumps into another student. After 3 minutes ask them to stop, remove their blindfolds, and record the number of times each student has bumped into another.

Repeat the game with 10 students, 15, 20, etc. Make sure that the duration of the game in each case is identical. Note readings for each game.

Now take the students outdoors. Cordon off a suitable area and repeat the game with all the students in the class participating at the same time. Vary the area cordoned off in each game.

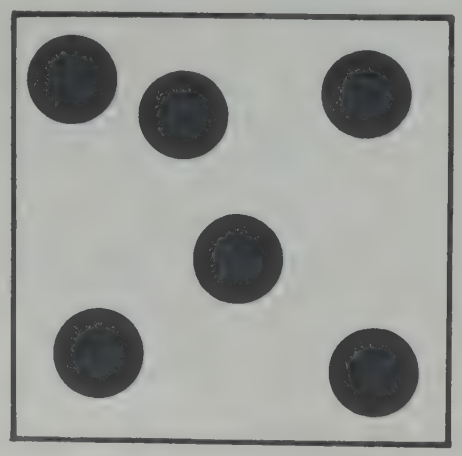
For each game recorded, both indoors and outdoors, calculate the relationship between the frequency of bumping and the degree of crowding (i.e. the proportion of number of students to space available).

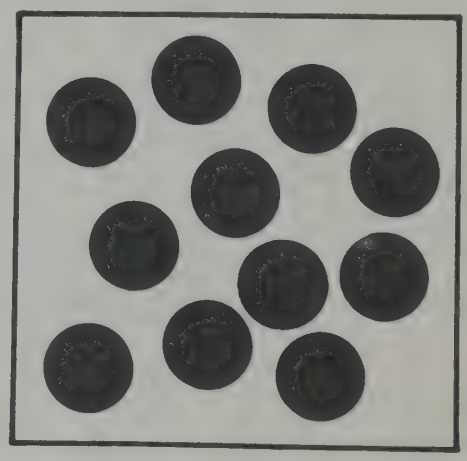
Explain how space is a resource, just like money, food (energy), etc., and how the pressure of population on resources causes stresses.

Evaluation

Ask: If a packet of 100 sweets is distributed in the class, how many would each student get? If the class were half its size, how many would he get?

If your family had four more members, how would it affect you in terms of space, food, clothing, etc., assuming that income remained the same?





NOTHING FOR GRANTED

74

Objectives

To understand how even small parts of the body (in this case, our fingers), perform an important function.

Activity

- Ask a student to pick up one object at a time, like a pen, a tea-cup, a knife, a ball etc.
- The other students should observe closely which fingers are being used in holding and picking up each of these objects, and in what manner (i.e. gripping, propping up, manipulating, propelling etc.)
- Through this observation they should be able to identify which fingers are used for which specific activity.
- Once the use of particular fingers for holding a particular object is identified, students should be asked to try to hold that object without using one of the fingers normally used.

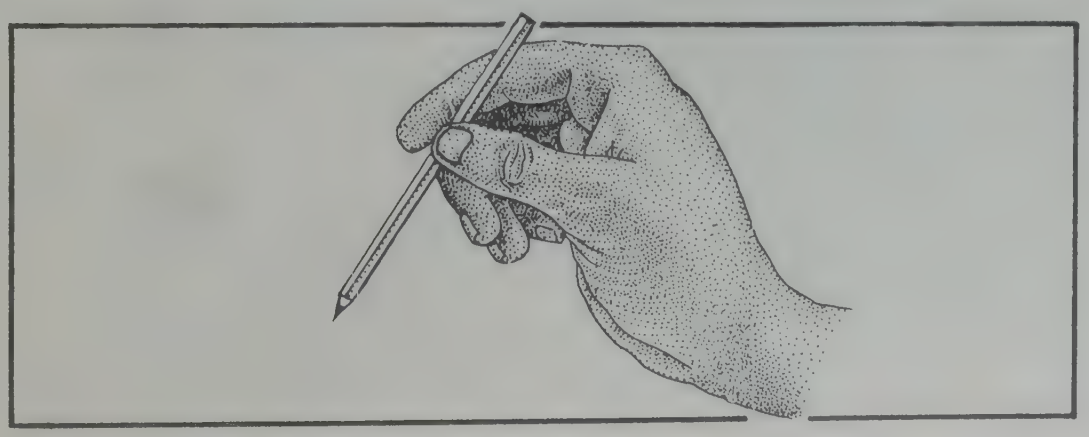
For example, try to hold a pen and write without using the thumb.

Students will discover how difficult it is to do this and in this way learn that each finger has a specific function to perform.

This will also sensitize them to the difficulties that handicapped persons face. Efforts and skills needed to train other parts of the body to substitute for the missing parts would now be appreciated.

Variation/extension

- Ask students to imagine what it would be like to have a different type of hand. Take some card paper and make 5 tubes of 15 cms each to fit each finger. Now ask the students to use these extended fingers for various purposes and compare with their earlier experiences.
- While eating students should observe in how many different ways fingers are used with different food items.



Thrust area
Environment

Subjects
Science, Craft

Place
Classroom

Group size
Groups of 2 to 3

Duration
30-45 minutes

Materials
Small objects of daily use — pen, knife, screwdriver, tea-cup, glass, book, spoon, funnel, etc.

75 RECYCLE WASTE INTO TOYS

Thrust area
Conservation

Subject
Craft

Places
Classroom, Home

Group size
Individual

Materials
A variety of used objects and materials normally thrown away

Objectives

To demonstrate how waste material can be used to create new things and introduce the concept of waste recycling.

Activity

A lot of materials that we throw away can be saved and used to make a variety of things. Such materials include newspapers, empty cigarette packets and foils, match boxes, matchsticks, paper boxes, buttons, broken bangles etc., bottle tops, hair, coconut shells, bits of thread twine, empty shoe polish tins, cardboard from old notebooks, rags from used clothes or tailors acting leftovers, old top, feathers, seeds of watermelon, tamarinds, groundnut shells, rice or wheat husks, waste cotton, bent nails, paper pins, clips, safety pins, twigs, dry leaves, used ballpen refills, wood shavings, saw dust, medicine bottles and caps.

Ask the students to bring some such materials for this activity. The students may be asked to make objects that they might find useful in their daily lives out of these used materials:

They can be asked to make a picture or a sculpture from discarded material. Are there any other ways in which they can use this material?

Variation/extension

Find out from a 'Kabadiwallah' what kind of materials he buys from people. What does he do with all these materials?

Can you identify any such "reused" materials among the things that are regularly brought into your home?

Subject areas

Activities Classified by Subjects

Science
Activity Numbers : 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 22, 26, 27, 28, 29, 30, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 44, 45, 46, 47, 48, 49, 50, 51, 52, 54, 55, 56, 57, 59, 61, 64, 65, 66, 67, 68, 69, 70, 72, 74

Craft
Activity Numbers : 5, 10, 17, 18, 20, 30, 32, 35, 40, 42, 43, 44, 46, 47, 51, 60, 63, 69, 71, 72, 74, 75

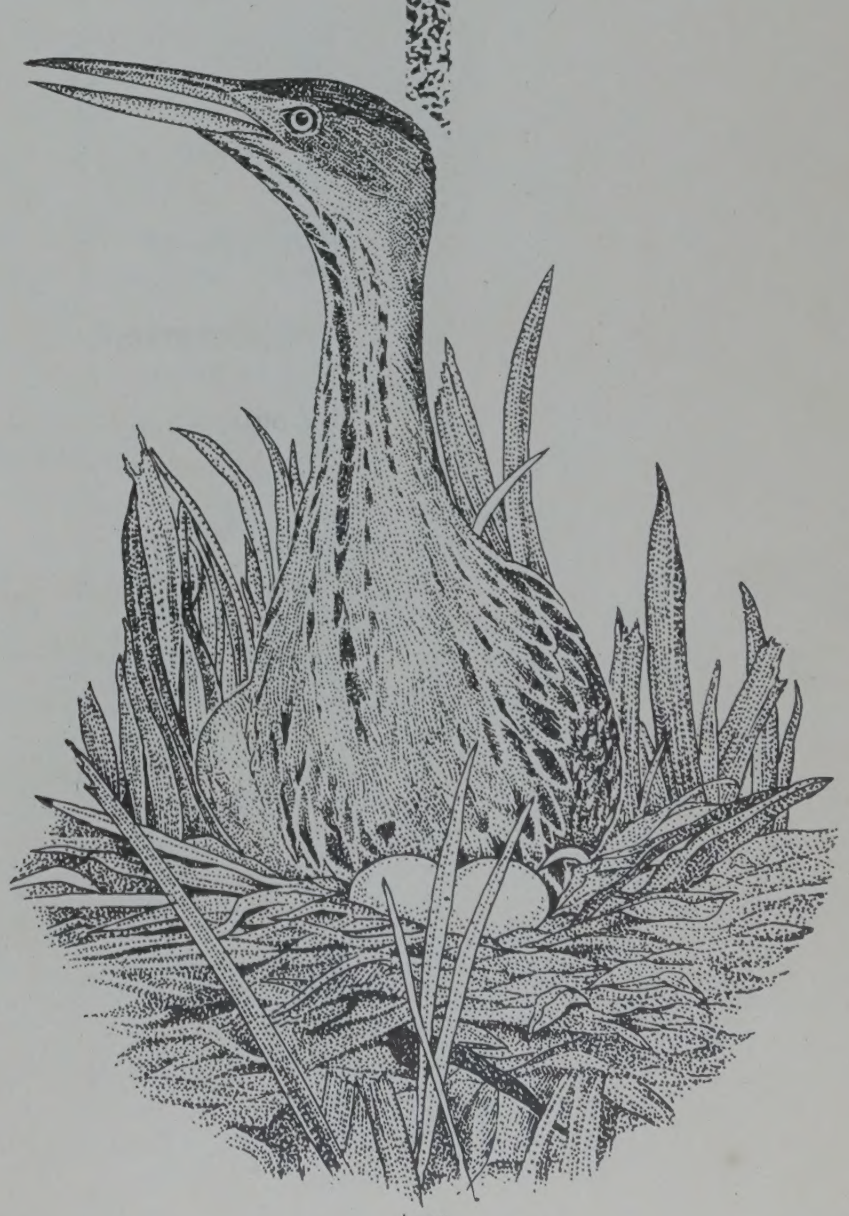
Performing Arts :
Activity Numbers : 23, 24, 31, 40, 62

Social Studies
Activity Numbers : 2, 42, 65, 67, 71, 73

Physical Training
Activity Numbers : 13, 25, 34, 58

Mathematics
Activity Numbers : 14, 19, 42, 48, 53, 73

Language
Activity Numbers : 40



Thrust areas

Activities Classified by Thrust Areas

Environment General
Activity Numbers : 1, 4, 7, 8, 9, 10, 12, 18, 19, 21, 22, 28, 29, 30, 37, 39, 43, 44, 45, 46, 48, 49, 51, 52, 56, 60, 62, 63, 64, 65, 66, 72, 74

Ecology
Activity Numbers : 3, 4, 8, 14, 15, 34, 41, 53, 54, 55, 57, 59, 61

Wildlife
Activity Numbers : 4, 6, 14, 15, 17, 24, 33, 34, 35, 36, 40, 42, 53, 54, 55, 57, 75

Energy
Activity Numbers : 23, 35, 50, 59, 69, 70

Habitat
Activity Numbers : 9, 13, 14, 17, 19, 25, 27, 34, 45, 73

Health
Activity Numbers : 2, 23, 26, 65

Pollution
Activity Numbers : 2, 38, 54, 55, 65

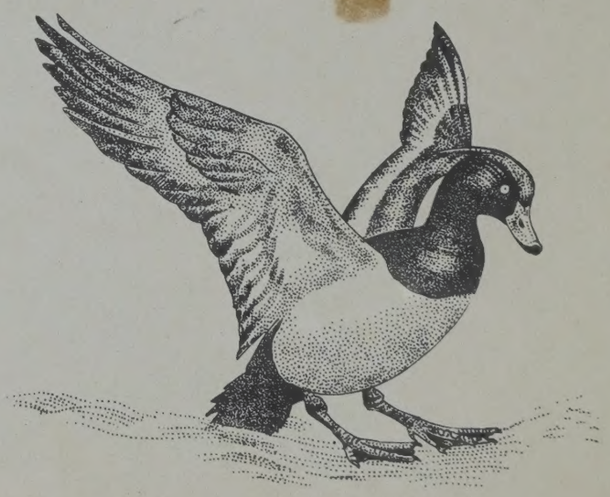
Population
Activity Numbers : 67, 71, 73

Conservation
Activity Numbers : 4, 12, 25, 31, 32, 37, 42, 56, 65

Agriculture
Activity Numbers : 20, 32, 47

Forestry
Activity Numbers : 8, 11, 31, 32, 44, 54

Nutrition
Activity Numbers : 68



Estd.-1989
P. 36 Pages.

Shikshamitra

EDUCATION RESOURCE CENTRE

62B, Alipore Road, Kolkata -700027

Ph: 2479 9271

RETURN DATE SLIP

DUE DATE	DUE DATE	DUE DATE

Centre for Environment Education
Nehru Foundation for Development
Ahmedabad 380 054, INDIA